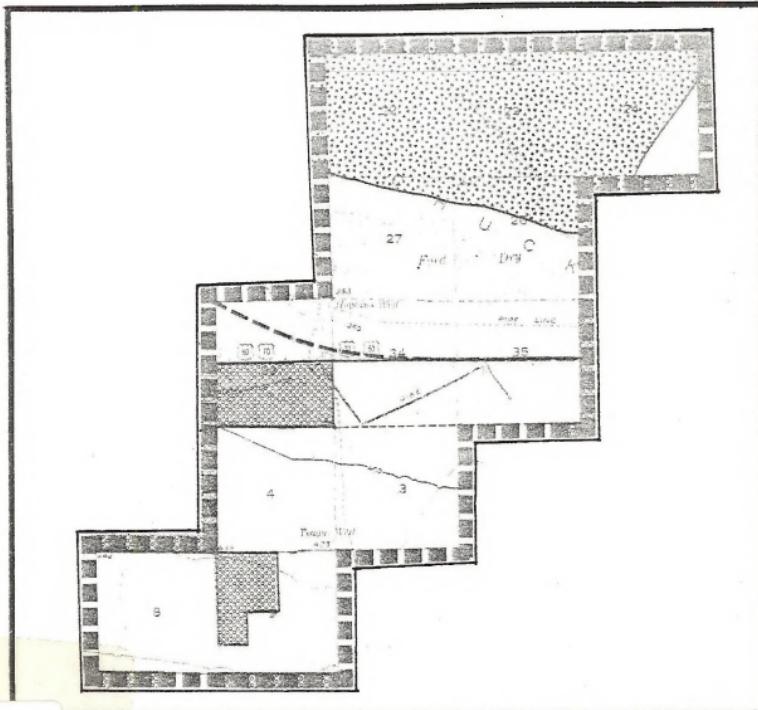


Final

FORD DRY LAKE KNOWN GEOTHERMAL RESOURCE AREA (K.G.R.A.)

Environmental Assessment

(#CA-066-1-2)



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Department of the Interior Bureau of Land Management
California Desert District Indio Resource Area July 1981

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Interested Parties:

Subject: Final Environmental Assessment (EA) for Proposed Competitive Geothermal Leasing in the Ford Dry Lake Area of Eastern Riverside County, California.

Enclosed is a copy of the Final Environmental Assessment (EA) for proposed competitive geothermal leasing in the Ford Dry Lake Area. This EA analyzes the impacts which would result if the geothermal resources were developed in the study area.

The impacts of subsequent plans of operation prepared by the lessee, will be addressed in site specific Environmental Analyses which will be prepared by the United States Geological Survey (USGS).

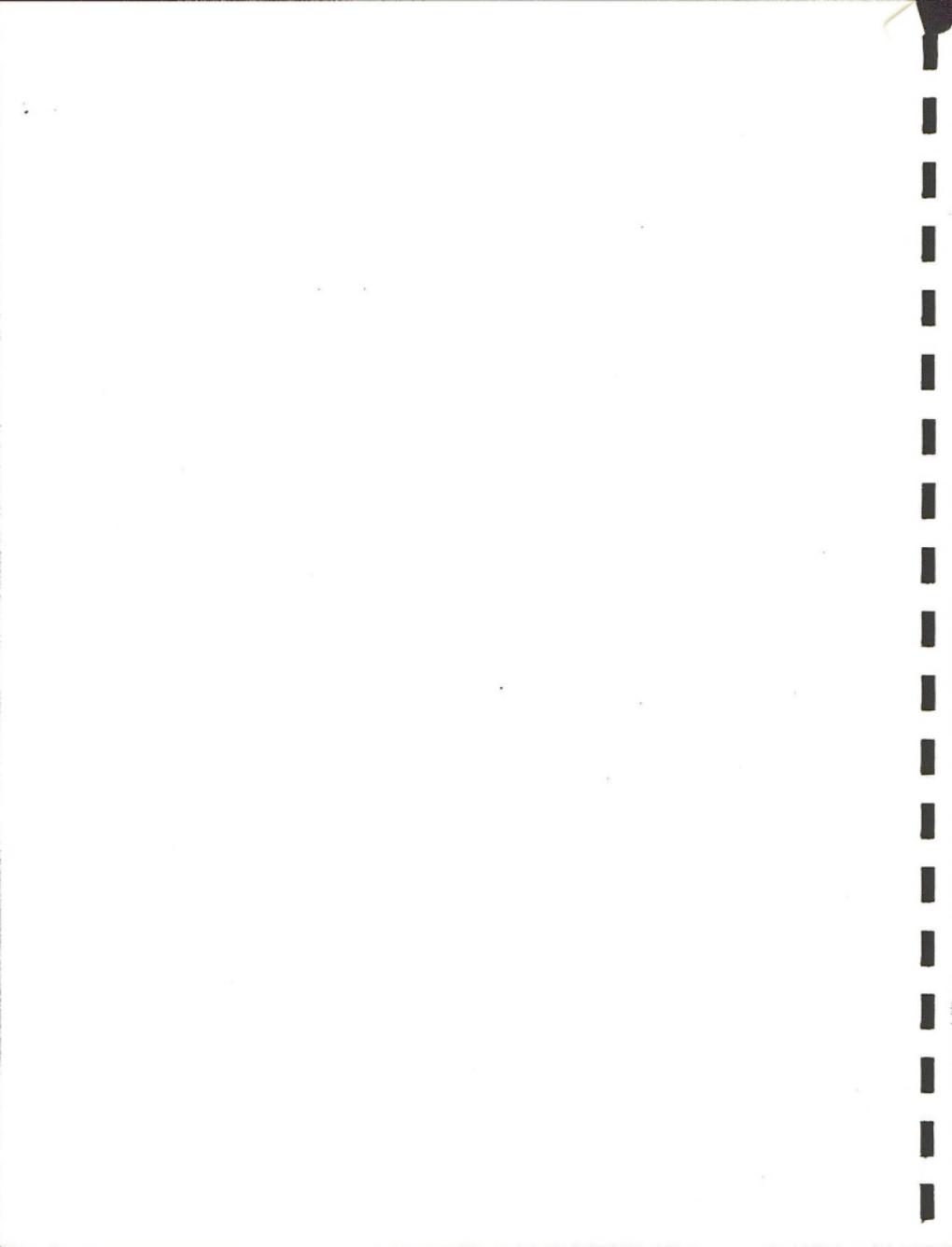
If you have any questions concerning this document, please call Pam Elliott, Team Leader, at (714) 787-1382.

Sincerely,

Brian B. Booher
Area Manager

Enclosure

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FINAL
Environmental Assessment # CA-066-1-2
for
Proposed Geothermal Leasing
in the
Ford Dry Lake Known Geothermal Resource Area
Riverside County, California

Prepared by
the
United States Department of the Interior
Bureau of Land Management
California Desert District
Indio Resource Area Office



Prepared by:
Pamela M. Elliott, Team Leader

September 9, 1981

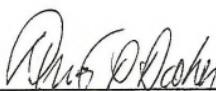
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Reviewed by:
John A. Hall, Chief of Resources
Indio Resource Area

September 10, 1981

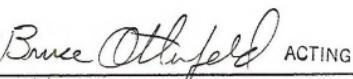
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Recommended by:
Brian B. Booher, Area Manager
Indio Resource Area

9-11-81

Date


ACTING

Approved by:
Gerald E. Hillier, District Manager
California Desert District

9/23/81

Date



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Note: The following are on file at the Indio Resource Area Office

- A. Geothermal Resource Lease
- B. Geothermal Resource Order #4
- C. Correspondence Received During the Public Review Period
(July 4, 1981 - August 17, 1981)
- D. Wildlife Specialist's Report
- E. Vegetation Specialist's Report
- F. Cultural Resources Specialist's Report
- G. Soil Specialist's Report
- H. Hydrologist's Report
- I. References

1. SUMMARY OF ANTICIPATED IMPACTS

| Resource & Alternatives | Impact Level after Mitigation | Acreage (Total Study Area 7680 Acres) | Comments |
|--|-------------------------------|---------------------------------------|---|
| Geology Proposed Action Alternative 1 | No No | 7680 7680 | No anticipated impacts |
| Hydrology Proposed Action Alternative 1 | Low No | 7680 7680 | Due to some alteration of natural surface drainage. No anticipated impacts |
| Soils Proposed Action Alternative 1 | Low No | 7680 7680 | Due to low amounts of displacement, compaction, and some accelerated erosion. No anticipated impacts |
| Climatology Proposed Action Alternative 1 | No No | 7680 7680 | No anticipated impacts |
| Air Quality Proposed Action Alternative 1 | Moderate No | 7680 7680 | Due to possible emission of non-condensable gases. No anticipated impacts |
| Vegetation Proposed Action Alternative 1 | Moderate Low No | 3330 4350 7680 | Due to destruction of plants, soil disturbance, water table decreases, damage from wind-born and water-born pollutants, or declining vigor if water or nutrients are diminished. No anticipated impacts |
| Wildlife Proposed Action Alternative 1 | Moderate Low No | 3640 4040 7680 | Due to: Direct loss of habitat, disruption of behavior, physiological changes caused by noise, pollution caused mortality or habitat degradation, vehicle mortality or disruption of activities. No anticipated impacts. |
| Domestic Animals Proposed Action Alternative 1 | Moderate Low No | 640 7040 7680 | Impacts to grazing: Due to small percentage loss of range area w/important annual forage. No anticipated impacts |
| Cultural Resources Proposed action Alternative 1 | High Moderate Low No | 960 4020 2700 7680 | Due to: Destruction of known or possible locations of archaeological sites. Even if collected, the site will be gone from its original context. At best, all the data possible will have been salvaged. No anticipated impacts |

| Resource & Alternatives | Impact Level after Mitigation | Acreage | Comments |
|---|-------------------------------|--------------|---|
| Visual Resources Proposed Action | Low | 7680 | Due to disruption of a low quality landscape which is highly visible due to flat terrain |
| Alternative 1 | No | 7680 | No anticipated impacts. |
| Recreation Proposed Action | Low | 7680 | Due to some displacement of recreationists who use area for hunting. No anticipated impacts. |
| Alternative 1 | No | 7680 | |
| Wilderness Proposed Action | Low | 2700 | Due to the possibility of diminished wilderness qualities. |
| Alternative 1 | No | 2700 | No anticipated impacts. |
| Land Use Proposed Action Alternative 1 | No No | 7680 7680 | No anticipated impacts. |
| Socio-Economics Proposed Action Alternative 1 | No No | 7680 7680 | No anticipated impacts. |

CONCLUSIONS

The Summary Map (Map 1) graphically indicates areas of high sensitivity which also are anticipated to be high impact areas. Mitigation measure #6 proposes to strongly discourage development in all cross-hatched zones. If accepted, no impacts will occur in these areas. The remainder of the study area has low or moderate anticipated impacts and is recommended as suitable for lease.

FORD DRY LAKE GEOTHERMAL E.A.

Summary

 AREAS WHICH HAVE HIGH SENSITIVITY AND HIGH IMPACTS

CR-CULTURAL RESOURCES

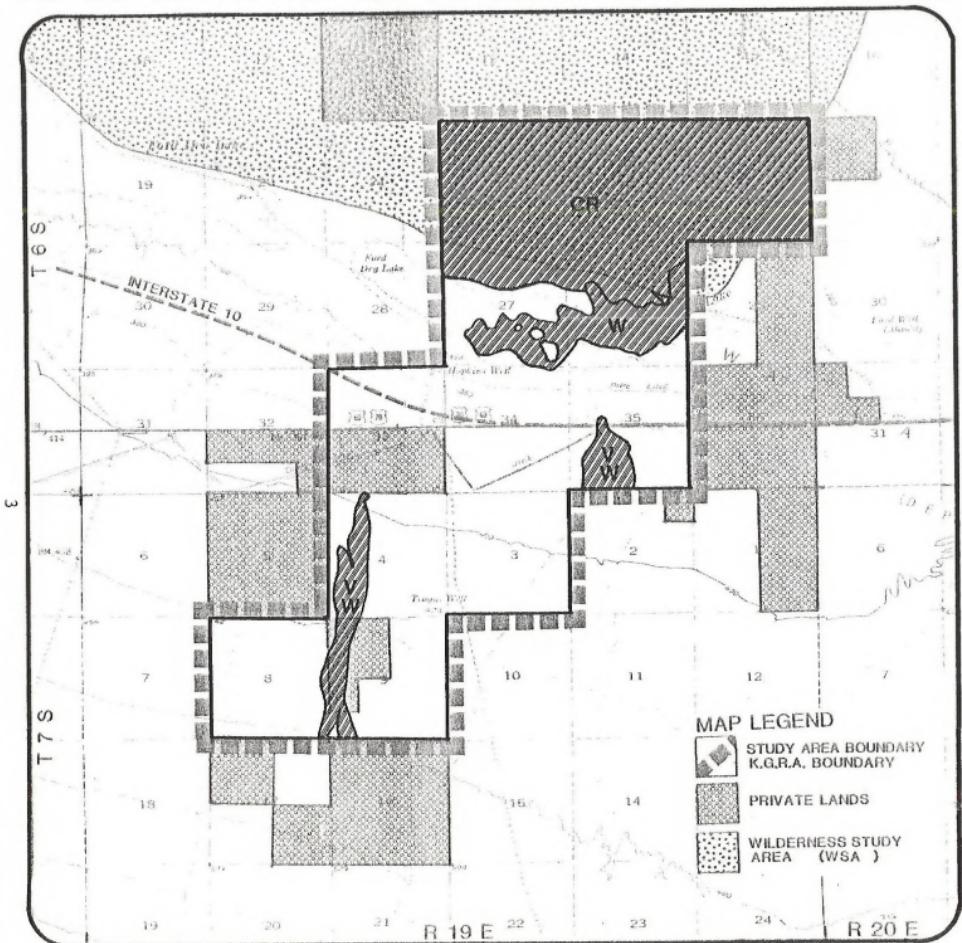
W-WILDLIFE

V-VEGETATION

Map 1



0 MILES 1 2



II. INTRODUCTION AND DESCRIPTION OF PROPOSED ACTION

A. Introduction

Purpose and Need

This Environmental Assessment (EA) is being prepared by the Bureau of Land Management to determine if competitive geothermal leasing would be appropriate in the Ford Dry Lake Known Geothermal Resource Area (KGRA). The KGRA may have the potential of accommodating three 2560 acre leases, each of which could support a 50 megawatt (MW) generating plant per lease. If the temperature of the geothermal resource were too low for power generation, the KGRA may accommodate a light industrial facility. The impacts of this light industrial facility have not been addressed in this EA. The production of electrical power, or the facilitation of a light industry utilizing the geothermal resource is the purpose of this proposed action.

With present air quality limitations on coal and gas fired electrical generating plants, and the moratorium on nuclear power plants in California, geothermal power is one of the few alternatives remaining capable of meeting long term electrical energy demands.

It is a policy of the Bureau of Land Management to provide Federal land for the exploration, production, and utilization of energy resources. This policy is the result of various Federal laws, the primary ones being the Mineral Leasing Act of February 25, 1920 (coal, oil and gas, and other minerals), and the Geothermal Steam Act of December 24, 1970.

B. Issue Identification

The major issues associated with geothermal leasing in the Ford Dry Lake KGRA are impacts to: (1) wildlife (2) vegetation and (3) cultural resource values.

This EA analyzes the impacts that will occur as a result of the proposed leasing action. The document will present analyses of two alternative actions which BLM managers can use as a tool to assess impacts resulting from the proposed action. The EA was subject to a 45 day public review period. BLM managers will use the resultant final document as the primary tool for making determinations in the following three areas:

- 1) The sensitivity of the study area's resources to geothermal development;
- 2) The need for further study by calling for an Environmental Impact Statement (EIS); or

- 3) If leasing should occur, under what conditions shall leasing be allowed.

C. Study Area Description

The Ford Dry Lake KGRA is located in the Chuckwalla Valley in Eastern Riverside County, California within:

Sections 3, 4, 8, and 9, T. 7 S., R. 19 E., SBBM and

Sections 22, 23, 24, 26, 27, 33, 34, 35, T. 6 S., R. 19 E., SBBM.

The area is located approximately 18 miles west of Blythe, California and is bisected by Interstate 10. Portions of the Ford Dry Lake Bed are included in the boundaries.

The EA study area is comprised of 7680 acres of land, 520 acres of which are privately owned and 7160 acres of which are public lands administered by the Bureau of Land Management.

D. Background - The Geothermal Resource

Development of geothermal resources involves the harnessing of the natural heat energy of the earth. This heat energy will be used for the generation of electricity and other alternative uses. The production fluid may produce commercially valuable by-products (minerals, gas, etc.) It should be noted that knowledge of the geothermal energy resource is still being developed.

In a geothermal hot water system, the circulating hot-water transmits heat energy and controls subsurface pressures (White and Williams, 1975). Thermal energy is stored in hot rocks and is transferred to the fluid which fills the pores and voids in the rocks. The concept of circulation is based upon the heat convection theory. When the hot circulating fluids are tapped by well bores, the fluid may flash to steam and can be used to turn a steam turbine or do other forms of work.

E. Proposed Action and Alternatives

Once the EA has been completed and if impacts are shown to be of such a nature that they are mitigable and/or acceptable, competitive leases will be let on the area. The KGRA has the potential for three 2560 acre leases. For the purpose of this analysis, it is assumed that three geothermal leases will be let and that production will reach the maximum levels of surface disturbance as defined in the model.

The prospective lessees will explore for and possibly develop geothermal resources for the purpose of generating electrical energy for light industrial uses, for use locally, or possible export from Riverside County.

The Development Model describes the surface disturbances and technical activities necessary to complete the development of a geothermal power plant on each of the lease areas. An investigation of BLM leasing procedures has resulted in the following two possible leasing decisions which might be acted upon by BLM management.

1. Proposed Action

The Proposed Action, if chosen, would provide for the leasing of all public lands within the Ford Dry Lake KGRA, with all stipulations of the standard lease form (3200-21-May 1974-Geothermal Resources Lease) and the mitigation measures described in the GRO orders (Geothermal Resources Operational Orders-1976-Orders 1-7 USGS Conservation Division-Menlo Park) being applied.

This alternative will provide for surface access to all portions of the study area including the Wilderness Study Area (WSA). The environmental impacts of such access would be controlled through the application of GRO Order No. 4 and those standard environmental protection stipulations developed as mitigation measures in the subsequent environmental reviews of required plans of operation.

2. Alternative Action #1/Decision Not to Lease

This alternative would not permit the leasing of the subject property for the purposes of geothermal resource exploration and development. This action would provide maximum protection to all resource values at the expense of geothermal resource development.

F. Development Model

Quantifying surface impacts due to geothermal development activities, is impossible without additional down-hole geotechnical investigations and testing. However, studies of like actions on the East Mesa Area of Imperial County demonstrate the plausible sequence of events leading to and including the development of a geothermal resource in the Ford Dry Lake Area. It is suggested the reader make reference to these documents for a complete discussion of the process (Environmental Assessment #78 and 99 - 100 et al, United States Department of the Interior Geological Survey 1978, 1979).

If the study area proves to be a stable resource equal to or better than the East Mesa KGRA, a lease covering 2,560 surface acres could support one fifty megawatt (50 MW) generation facility. Of the estimated 2,560 acres, 7.6% will be directly disturbed by development activities and 20% will be indirectly disturbed. The 7.6% would include all surface disturbances associated with each of the five steps of development summarized below. These estimates are based upon the Republic Geothermal and Magma proposals of development within the East Mesa KGRA.

The economic life of the proposed geothermal development cannot be accurately estimated due to a need for more data on the size, temperature, and type of resource available. However, for the purpose of this environmental investigation, the 30-50 year economic life of the generation equipment will be the assumed base from which estimates of impacts will be made.

1. Preliminary Exploration

The technical requirements of this stage involve many activities ranging from airborne exploration, topographical and geological mapping, geophysical exploration, geochemical surveys, to drilling shallow (<500') seismic and temperature gradient holes. Most of these activities involve small crews of two or three people and small trucks for transportation of the crew and truck-mounted and hand-held equipment. The existing roads and trails system within the study area could accommodate these vehicles. All drilling should occur within the general vicinity of existing roads & trails.

2. Exploration Drilling

This stage includes the drilling of geologic information holes, exploratory wells, and test flow operations. A basic requirement of this phase is the use of large drilling equipment that is capable of reaching depths of 10,000 feet or more. Access roads and drilling sites will require extensive surface disturbance to accommodate this equipment. Drilling equipment, technology, and methods are similar to oil and gas operations and could require as much as three acres of surface disturbance per well site plus access road development. Disposal of drilling wastes from geothermal test wells will be in accordance with California Division of Oil and Gas (Department of Conservation) and the Basin Plan of the Colorado River Basin Regional Water Quality Control Board. For purposes of this EA, this phase will be assessed using the following acreages for analysis:

TABLE I

Anticipated Impacts Caused By
Exploration for Geothermal Energy on One 2,560 Acre Lease

| | Unit | Acres Per Unit | Total Acres Disturbed |
|--|------|----------------|--|
| Wells | 6 | 3 | 18 |
| Disposal Ponds (Test Flow Operation) | 1 | 2 | 2 |
| Roads | 2 | 4 | 8 |
| Total | | 28 | = 1.1% of total lease areas (2560 acres) |
| Total 3 leases = 84 acres impact of 7,680 Acres | | | |

3. Field Development

This phase will be dependent upon successful exploration drilling. Included in this stage are all activities from the decision to develop an identified resource to production of commercial power and its transmission. It is in this phase that the greatest impacts can occur. The power plant, transmission lines and well site will all be constructed and connected by a series of access roads.

A worst-case assumption which is used for analysis in this EA would be a combination of two development techniques already in use in the East Mesa KGRA. The single well checkerboard field development pattern and the cooling pond generation site are both highly surface consumptive in comparison to other techniques of development. It is recognized that geologic conditions often dictate how a geothermal resource can be developed. However, as a description of surface disturbances, this appears to be the most consumptive of surface resources. For the purposes of this EA, this phase will be assessed using the following acreages for analysis:

TABLE II

Anticipated Impacts Caused By
Development of One 50 MW Power Plant on One 2,560 Acre Lease

| Unit | Number of Acres Disturbed Per Unit | Number of Units | Acres Disturbed |
|---|------------------------------------|-----------------|-----------------------|
| Power Plant Complex | 5 | 1 | 5 |
| Well | 3 | 22 | 66 |
| Disposal Pond & Sump | 4 | 1 | 4 |
| Pipeline | 1 | 28.76 | 28.76 |
| Access Roads | 2.5 | 30 | 75 |
| Mainline Road | 10 | 1 | 10 |
| Transmission Line | 5.8 | 1 | 5.8 |
| Total | | | 194.56 Acres = |
| 7.6% of total lease area of 2,560 Acres | | | |
| Total 3 Leases = 583.68 acres directly impacted of 7,680 Acres | | | |
| Indirect Impacts = 20% of each lease = 512 acres | | | |
| Note: Magma Geothermal Plant (Imperial County) had 7.6% direct impacts. Republic Geothermal Plant (Imperial County) had 3.4% direct impacts. | | | |

TABLE III

Anticipated Impacts Caused by Development of a 50 MW Power Plant on One 2,560 Acre lease located with restrictive mitigation (well head islands, directional drilling techniques, and cooling towers shall be utilized)

| Unit | Number of Acres Disturbed Per Unit | Number of Units | Acres Disturbed |
|--|------------------------------------|-----------------|-------------------|
| Power Plant Complex | 10 | 1 | 10 |
| Well, Disposal Pond & Sump | 5 | 3 | 15 |
| Pipeline | 1 | 12 | 12 |
| Access Roads | 2.5 | 15 | 37.5 |
| Mainline Road | 10 | 1 | 10 |
| Transmission Line | 5.8 | 1 | 5.8 |
| Total | | | 90.3 Acres |
| 3.53% of the lease area of 2,560 acres | | | |
| Total 3 Leases = 270.9 acres directly impacts | | | |
| Indirect Impacts = 256 Acres = 10% of one lease area | | | |

4. Production and Operation

The activities in this stage will consist of the operation and maintenance of the power production system, the drilling of replacement wells, waste disposal, and water utilization. Full scale operations can be expected to continue for many years. Repair, maintenance, monitoring and operating field equipment will require periodic use of access roads by large scale equipment.

5. Closedown

Closedown and site abandonment will occur when the geothermal resource is depleted beyond the point of economic recovery or use. Geothermal resources have been utilized in the United States and in other countries for many years. However, the total economic life span of the resource has not yet been determined. For the purposes of this EA, 30 to 50 years is assumed. This represents the amortization period of a power plant and the period in which new technology could replace that of the present. At this time, a geothermal power plant could be upgraded with new equipment or replaced if other generation technology had become more economical. The closedown phase will include the removal of all facilities, and the abandonment of all wells. This phase could occur earlier if exploration did not find an economically useful resource.

6. Interrelationships with U.S. Geological Survey

If leases are awarded, the U.S. Geological Survey (USGS) becomes the lead agency in the preparation of the additional required EAs, soliciting input from BLM and other responsible and concerned agencies. Prior to any activity in a lease, the lessee must submit detailed Plans of Operation (PO) to the USGS who subsequently directs a cooperative (BLM-USGS) preparation of an EA which will specifically address the impacts of the identified activity in the PO. Subsequent phases of development are addressed in a like manner.

III. DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. Introduction

This section describes in summary form those components of the environment which are likely to be impacted by the proposed action and alternatives. Descriptions are commensurate with the expected magnitude and intensity, duration, and incidence of impacts. Complete specialist's reports which contain species list, methodologies, and other support data, are on file at the Indio Resource Area Office.

Each resource specialist has zoned the study area into zones of High, Medium, and Low Sensitivity. These sensitivity ratings are a reflection of how sensitive an area is to change in addition to how important the values contained in the zones are on a desertwide perspective.

In each resource section, the criteria used for defining the zones is provided along with a map showing the locations of the zones. In cases where only one sensitivity value has been assigned, no map is provided.

B. Non-Living Components

1. Geology

The Ford Dry Lake KGRA is located in the Chuckwalla Valley. Surficial deposits consist of lake deposits, sand, and valley fill all of Quarternary age (Jenning, 1967). Two test wells drilled by USGS Conservation Division indicate that the valley fill consists of mixed and inter-layered gravel, sand, silt, and clay (Calzia, et al, 1979). Total depth of the valley fill is uncertain, but probably does not exceed several thousand feet. The sediment was most likely derived from the McCoy, Palen, Chuckwalla, and Little Chuckwalla Mountains.

Numerous faults have been mapped in the surrounding area, but none are known to be active. No earthquakes have been recorded in this part of southeast California for at least 81 years (Real, 1978).

The geologic sensitivity of the entire Ford Dry Lake KGRA Study Area is rated low due to the absence of any value that could be harmed by this action.

2. Hydrology

The study area lies within the Chuckwalla Valley, an arid area of internal drainage with no perennial streams. Water runoff occurs only in response to infrequently intense rain storms. Much of the valley is subject to inundation either by sheetflow or flow confined to an expansive network of ephemeral drainage channels. Several water control dikes have been constructed south of Interstate 10 to protect the highway from flooding.

F. W. Giessner (1963) has conducted the most intensive investigation, to date, of groundwater occurrence in the Chuckwalla Valley. Ninety two wells and springs were inventoried. Groundwater depths for these wells ranged from 70 to 143 feet below the surface. Evaluation of water levels in the wells reveals a groundwater gradient from Desert Center to the southeast, toward the gap between the Mule and McCoy Mountains. Approximate water elevations in wells near the study area ranged from 275 to 300 feet above sea level.

The U. S. Bureau of Reclamation (1972) in judging the suitability of the area for extensive agricultural development, stated that groundwater recharge to the Chuckwalla Valley is "negligible." Discharge of groundwater from the Chuckwalla Valley is both natural and artificial. Natural discharge occurs through evapotranspiration where the water table is near the surface, primarily near Palen and Ford Dry Lakes. While industrial and domestic uses of water in the area are probably not significantly increasing, agricultural use is increasing due to development of jojoba plantations in the area.

Giessner (1963) compiled water quality records from several Chuckwalla Valley wells. Wells within the study area had concentrations of total dissolved solids over 2,000 milligrams/liter, a range generally unacceptable for agricultural and domestic use. The concentration of total dissolved solids northwest of the study area at Desert Center is much less, approximately 400-500 milligrams/liter.

The entire study area has been given a moderate sensitivity rating due to little existing groundwater development in the area, distance of the lease area from areas of extensive groundwater use (Desert Center) and relatively poor water quality within the lease area.

3. Soils

No detailed soil survey has been done for the Ford Dry Lake area. The best available information is in the Report and General Soil Map of Riverside County, California (1969).

Sensitivity of soils is rated as moderate for the entire Ford Dry Lake Geothermal Study Area based on similar criteria which were used to rate soil sensitivity for the Desert Plan. Soils with high sensitivity ratings (Appendix Volume E of Final Environmental Impact Statement and Proposed Plan, 1980) are those on slopes which can readily have accelerated water erosion if disturbed or which are covered with easily - scarred desert pavement. Soils with low sensitivity ratings include unstabilized sand dunes and many areas of riverwash. These areas have considerable ability to withstand compactive forces and a small potential for accelerated wind or water erosion with disturbance. Soils with moderate sensitivity, such as those in the Ford Dry Lake Geothermal Study Area, are more compactible than soils rated as having low sensitivity. They have less potential for accelerated erosion than the soils of high sensitivity on steeper slopes and less potential for long-lasting visual scars than soils covered by desert pavement.

4. Air Quality

Federal and State Air Quality Standards

Presently, certain air-quality standards are mandated by both the Federal and State governments. The major objectives of these standards are to protect the public from any known or anticipated adverse effects from air pollution. These standards are generally set conservatively to allow a margin of safety. California Air Quality standards are based on health effects and represent desirable levels of air quality which, on the basis of present knowledge, are expected to prevent health hazards or incipient degradation of health due to air pollution.

Existing Air Quality

The closest monitoring station to the study area was a mobile unit located west of Palo Verde which is approximately 15 miles southeast of the study area¹. The air monitoring site was not located in the town itself, but a few miles to the west to get a sampling of air typical of the desert rather than of the town.

¹Operated by the California Air Review Board (CARB)

The survey was conducted between September 1977 and December 1977. The station reported no violations of levels of carbon monoxide, sulfur dioxide, or nitrogen dioxide. A violation of the ozone standard was reported. However, it is interesting to note that even the most remote portions of the Southeast Desert Air Basin (SEDAB) violated the federal and state air quality standards for ozone on at least a few days of the year. The state and federal standards for total suspended particulate (TSP) were also exceeded in all of the areas surveyed in the study. Windblown dust, soil and sand are probably the principle causes of the widespread violation of the TSP standards in SEDAB.

5. Noise

Noise is an element of the environment which can be disruptive when high levels damage other environmental communities. Noise can cause hearing loss in some animals as well as disrupt communication between animals thus causing physiological changes. Frequencies and sound pressures that do not disturb one animal may disrupt another, depending solely upon the sensitivity of the receptor.

Background noise levels provide comparative data for evaluating the deleterious aspects of noise. While the ambient noise levels of the Ford Dry Lake Study Area have not been measured, probable levels can be extrapolated from data collected in other desert areas.

The Ford Dry Lake Study Area has several high noise level producing activities. The Chocolate Mountains Bombing and Gunnery Range is located approximately 15 miles to the southwest of the study area. The passage of aircraft over the study area (often at very low altitudes) coupled with the bombing within the range create a high intensity intermittent noise level. Interstate 10 bisects the study area producing additional increases in noise. Recreational Off Highway Vehicle (OHV) use of the area is present, but infrequent. OHV activities produce high level intensity noise. The noise level within the study area is extremely variable depending on the time, location, and intensity of activities during measurement, but probable ranges are as low as \pm 40 dBA to something in excess of 120 dBA.

C. Living Components

1. Vegetation

The major factor affecting distribution and diversity of vegetation at Ford Dry Lake is the periodic flooding and filling of the lake bed during periods of adequate rainfall. Where water is retained longest after filling, perennial vegetation is sparse to absent on these hard-caked mud flats. Annual plants, however, are most lush in this area of the lower lake bed after ponding occurs. Vegetation in the zones of more rapid changes in water level (pond edges) is composed mostly of non-native tamarisk (*Tamarix ramosissima* and *T. aphylla*), with some sparse mesquite (*Prosopis glandulosa*). Where a major wash drains into the lake bed, an alkali sink is created that supports two alkali-tolerant plant species, Inkweed (*Suaeda torreyana*) and Narrow-leaved Saltbush (*Atriplex canescens* ssp. *linearis*). The vegetation surrounding the lake is Sonoran Creosote Bush Scrub (as described by Cheatham and Haller, 1975), with variations caused by wash systems (creating areas of Ironwood Wash) or by substrate differences (desert pavement, sandy/gravelly alluvium, or windblown sand). These local variations within the Creosote Bush Scrub habitat have been mapped, defined, and inventoried separately for this report.

Seven vegetation types defined were based on perennial plant cover, plant composition, and substrate (see Map 2):

- A) Ironwood/Palo Verde Wash
- B) Moderate Cover Creosote Bush Scrub
- C) Inkweed/Saltbush Scrub
- D) Low Cover Creosote Bush Scrub/Desert Pavement
- E) Low Cover Creosote Bush Scrub/Windblown Sand
- F) Tamarisk Thickets with Mesquite
- G) Dry Lake Bed (sparse to barren)

Sensitive Species

No rare, threatened, or endangered plants are known to occur within or near the boundaries of the Ford Dry Lake KGRA (Powell, W. R., ed., 1980).

Sensitivity Zones

The variety of vegetation types within the Ford Dry Lake Study Area resulted in a broad range of sensitivity levels. Sensitivity ratings were based on perennial vegetation only. Distribution of annual plant species in the Ford Dry Lake area is extremely variable depending upon whether adequate

rainfall occurred to flood and fill the lake bed. This ephemeral (short-term) ponding may occur only once every five years, but when surface water does accumulate, annual plants are lush across the lower flats of the lake bed. Ford Dry Lake did not fill with water this year, and the dry, cracked mud-flats lining the lake bed are nearly devoid of any annual plant cover. Since annual plant composition and cover are so unpredictable from year to year, annual plant species were not used for determining sensitivity ratings.

Criteria for sensitivity ratings are based on the following factors:

- 1) Percent ground cover of perennial plants
- 2) Species diversity (indicated by the number of perennial species present)
- 3) Percentage of native (non-weedy) perennial species comprising the total plant cover within a vegetation type
- 4) Uniqueness of each vegetation type within the entire CDCA.

Using these criteria, three levels of sensitivity were defined for vegetation:

- High - Diverse assemblage of native plants found infrequently in the desert, having moderate (approximately 10-20%) ground cover.
- Medium - Assemblage of native plants found infrequently in the desert, but having a low species diversity; or
Assemblage of native plants found commonly in the desert with moderate species diversity and moderate ground cover.
- Low - Assemblage of native plants with low species diversity and/or low ground cover; or
Assemblage of plants with a high proportion of the total ground cover composed of non-native (weedy) perennial plants.

Criteria used in evaluating sensitivity of each vegetation type are summarized below:

FORD DRY LAKE GEOTHERMAL E.A.

Sensitivity Zones



High



Medium



Low

Map 2



Vegetation

MAP LEGEND



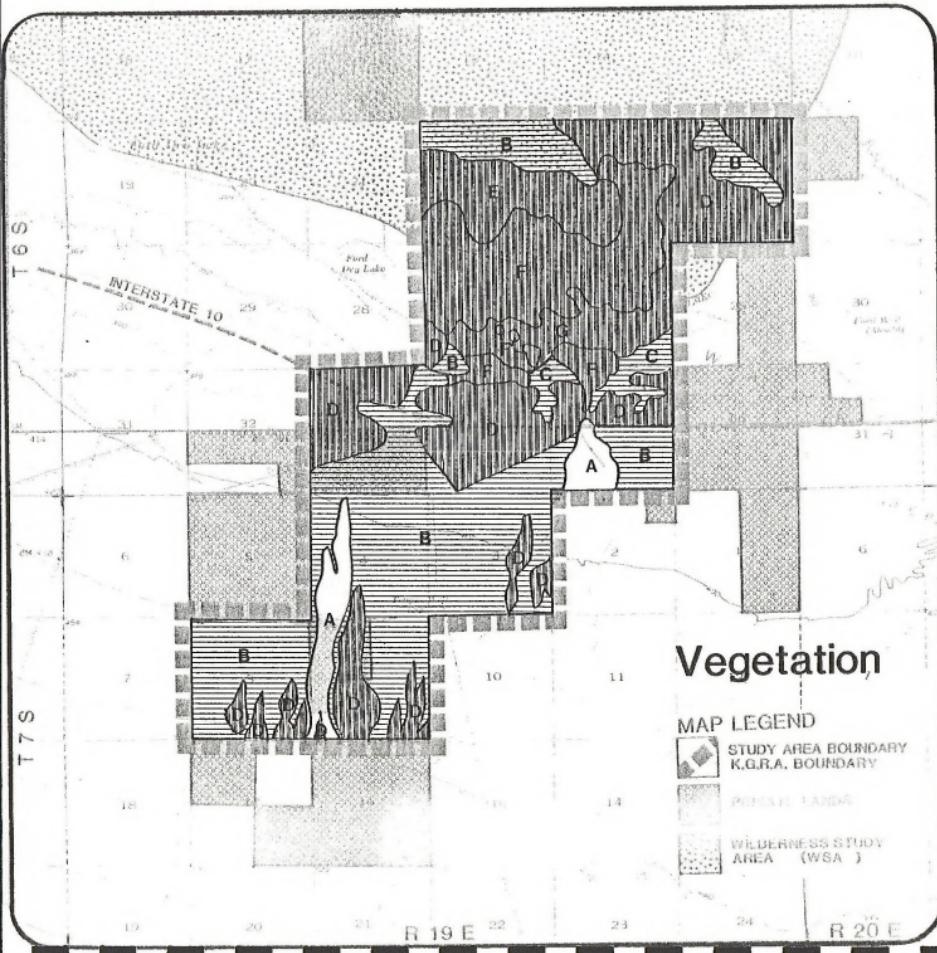
STUDY AREA BOUNDARY
K.G.R.A. BOUNDARY



PRIVATE LANDS



WILDERNESS STUDY
AREA (WSA)



Zone A - High sensitivity: Ironwood/Palo Verde Washes are uncommon within the CDCA, and support a higher plant diversity and ground cover than adjacent habitats.

Zone B - Medium sensitivity: Moderate Cover Creosote Bush Scrub, although common within the CDCA, has a fairly high species diversity and moderate ground cover.

Zone C - Medium sensitivity: Inkweed/Saltbush Scrub, although having low plant diversity is an uncommon assemblage within CDCA. Inkweed is restricted to soils containing both salt and alkali, and usually occurs at the edges of dry lakes where moisture is near the surface.

Zone D - Low sensitivity: Low Cover Creosote Bush Scrub/Desert Pavement occurs commonly in the desert, and has low ground cover.

Zone E - Low sensitivity: Low Cover Creosote Bush Scrub/Windblown Sand occurs fairly frequently in the desert, and at Ford Dry Lake has been invaded by exotic, weedy plants (Tamarisk species).

Zone F - Low sensitivity: Tamarisk Thickets with Mesquite, although not common within the CDCA at these densities, has a very low percentage of plant cover composed of native, non-weedy perennials.

Zone G - Low sensitivity: Dry Lake Bed (Sparse to Barren), although not a common occurrence within the CDCA, supports a low species diversity and very low perennial plant cover, with much of this cover composed of exotic, weedy tamarisk.

See Vegetation Map (Map 2) for location of Zones.

2. Wildlife

General

Six habitats were identified and inventoried within the Ford Dry Lake KGRA. The sensitivity of these habitats has been rated High, Moderate, or Low using the following criteria:

High - Very productive wildlife habitat supporting highly diverse and abundant fauna.

Moderate - Fairly common habitat, but supports a relatively abundant and diverse fauna.

Low - Common or exotic habitat supporting few species or numbers.

The criteria defined above were used to define the following zones that are shown on the Wildlife Sensitivity Map (Map 3).

Zone A - Dry Lake Bed - High Sensitivity

Extremely valuable wildlife habitat when water is present. Sensitive even when water is not present due to encysted invertebrates.

Zone B - Ironwood Wash - High Sensitivity

Supports abundant and diverse resident fauna. Important for migrating bird species.

Zone C - Moderate Cover Creosote Scrub - Moderate Sensitivity

Common habitat but supports relatively high numbers of individuals and species.

Zone D - Inkweed-Saltbush - Moderate Sensitivity

High density of wildlife although diversity is fairly low.

Zone E - Low Cover Creosote Scrub - Low Sensitivity

Low numbers and diversity

Zone F - Tamarisk Dunes - Low Sensitivity

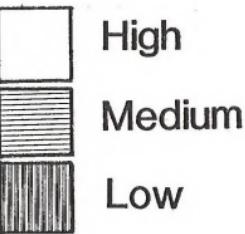
An exotic community that most resident fauna are not adapted to utilize.

The Dry Lake Bed, although very barren at the time of inventory, provides valuable wildlife habitat when runoff is sufficient to create a lake. The Lake Bed has been inundated 3 of the last 10 years. When water is present, the lake is very attractive to waterfowl. Other than the Salton Sea, Ford Dry Lake provides one of the only stop over points for migrating waterfowl and shorebirds in the southern California desert. The California Department of Fish and Game (CDF&G) has recorded up to 4000 ducks on the lake at one time (CDF&G, unpublished data, 1977). The lake also serves as a resting and feeding area for up to several thousand migrating shorebirds. Migrating and resident passerines also take advantage of the water, insects, and flush of vegetation at the lake.

The lake waters support at least three invertebrate species including tadpole shrimp (*Triops* spp.), fairy shrimp (*Branchinecta* spp.), and clam shrimp (possibly *Cypris* spp.) in abundance (CDF&G, unpublished data, 1978). These organisms are essential to waterfowl, shorebirds, and the nutrient cycling of the Ford Dry Lake ecosystem.

FORD DRY LAKE GEOTHERMAL E.A.

Sensitivity Zones



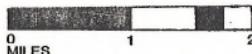
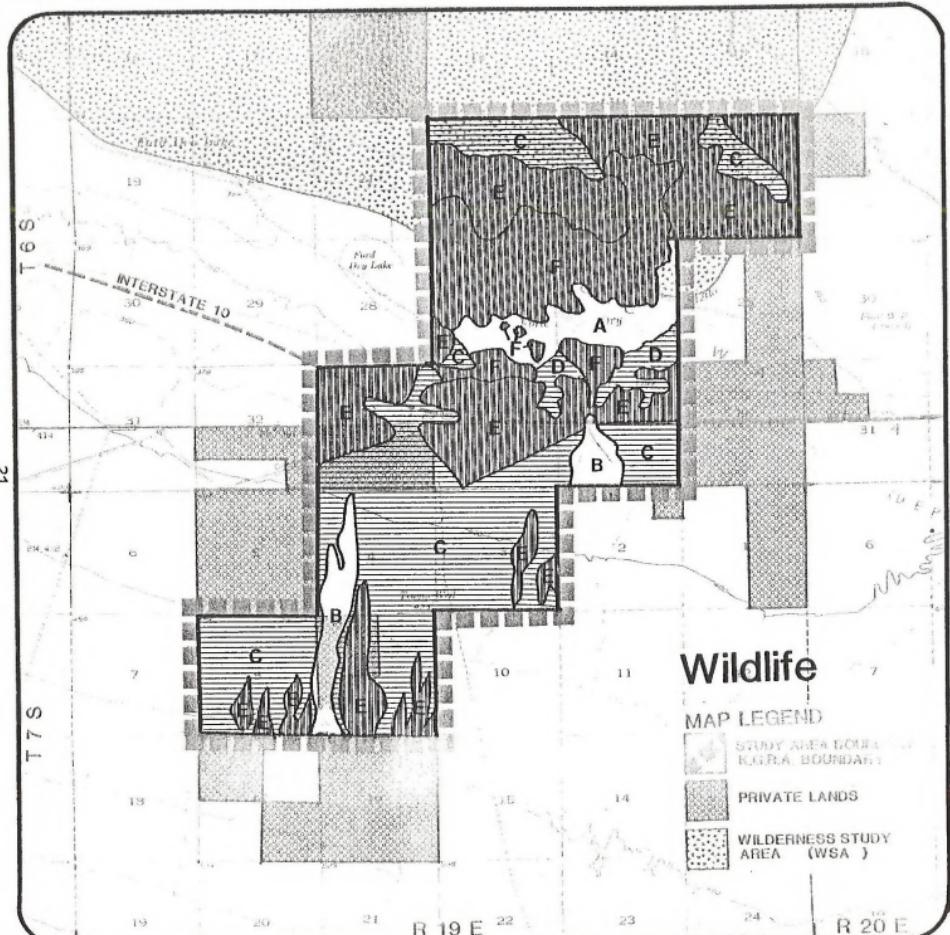
Map 3



Wildlife

MAP LEGEND

- STUDY AREA BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



Although no firm figures are available, CDF&G has noted in their records an increase in small mammals, desert cottontails, and black-tailed jackrabbits when water is present as evidenced by a significant increase in road kills along Interstate 10 near the lake. Because of the rarity of open water habitat in the California desert, this habitat has been given a rating of High sensitivity for the purpose of this EA.

Species of Special Significance

The Ford Dry Lake KGRA is within the range of the desert tortoise. The desert tortoise, Gopherus agassizii, is listed by the BLM (California) as a sensitive species and fully protected by the State of California.

Tortoise numbers are estimated to be very low within the study area. No tortoise sign was found north of Interstate 10 where habitats are essentially unsuitable for tortoise. Only the areas of Low Cover Creosote Scrub in the northeastern portion of the lease area could conceivably support a tortoise population and only a marginal one at best. In the areas south of Interstate 10, 6 skeletal remains were found. The lack of any tortoise burrows or fresh sign may indicate that the area is one where tortoise once, but no longer occur, or merely an area that has occasional transient tortoises. The lack of fresh sign could be explained in light of the severe drought conditions in the lease area. Virtually no green annuals were seen and the perennials lacked new growth.

A number of bird species on the Audubon Society's Blue List* have been recorded at Ford Dry Lake when water is present. These include; Marsh Hawk, Osprey, Western Grebe, White Pelican, Canvasback and American Bittern. Birds observed at Ford Dry Lake but listed because of declines outside of the southwest include; American Kestrel, Loggerhead Shrike, Long-billed Curlew, and Cliff Swallow.

The KGRA is near the western distribution limit of Couch's spadefoot toad (Scaphiopus couchii). This species is not listed, but is of special scientific interest. One known breeding site has been recorded 1.4 miles east of I-10 on the south side of Chuckwalla Road in an old highway borrow pit (Dimmit, 1977). The site is on private land, within a Cal Trans right-of-way and not included in any BLM issued lease. However, the site could be affected by the drilling within the study area.

* A list of those species declining in all or a portion of their range.

3. Domestic Animals

Grazing

The Ford Dry Lake Study Area has been used as an ephemeral grazing lease for the past 10 years. The customary use is 3 to 4 months in the winter and/or spring for grazing of sheep. The sheep which have been numbered between 500-4000 are controlled by herders and usually average 2000 in the herd.

The lease is currently 19,089 acres, but a proposal has been received to expand the lease by 47,200 acres to bring the total acreage to 66,289 acres.

The dry lake bed is particularly important for grazing because of the presence of the perennial Hoffmannsiggia that is used as a final feed of the year for sheep, and is very reliable in the area. For this reason, the dry lake bed area has been zoned moderately sensitive to disturbance. The remaining study area is important for forage, depending on precipitation, but the proposed action would not significantly affect grazing as a whole.

Water is currently trucked out to portable troughs. Plans are underway to construct improvements to provide water at the site. Although the nearest portable water source is highly mineralized (Wiley's Well), this is not a danger to sheep because they have a life span of only 8-10 years and accumulation in their systems of the minerals is not long enough to harm or kill them.

Other Domestic Animals

There are no other domestic animals currently being raised in the study area.

Summary of Sensitivity Zones for Domestic Animals

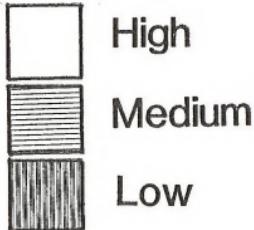
Zone A Moderate Sensitivity Due to the presence of Hoffmannsiggia which is a valuable forage for sheep.

Zone B Low Sensitivity Due to loss of such a small percentage of the specific range type.

See Map 4, for location of zones.

FORD DRY LAKE GEOTHERMAL E.A.

Sensitivity Zones



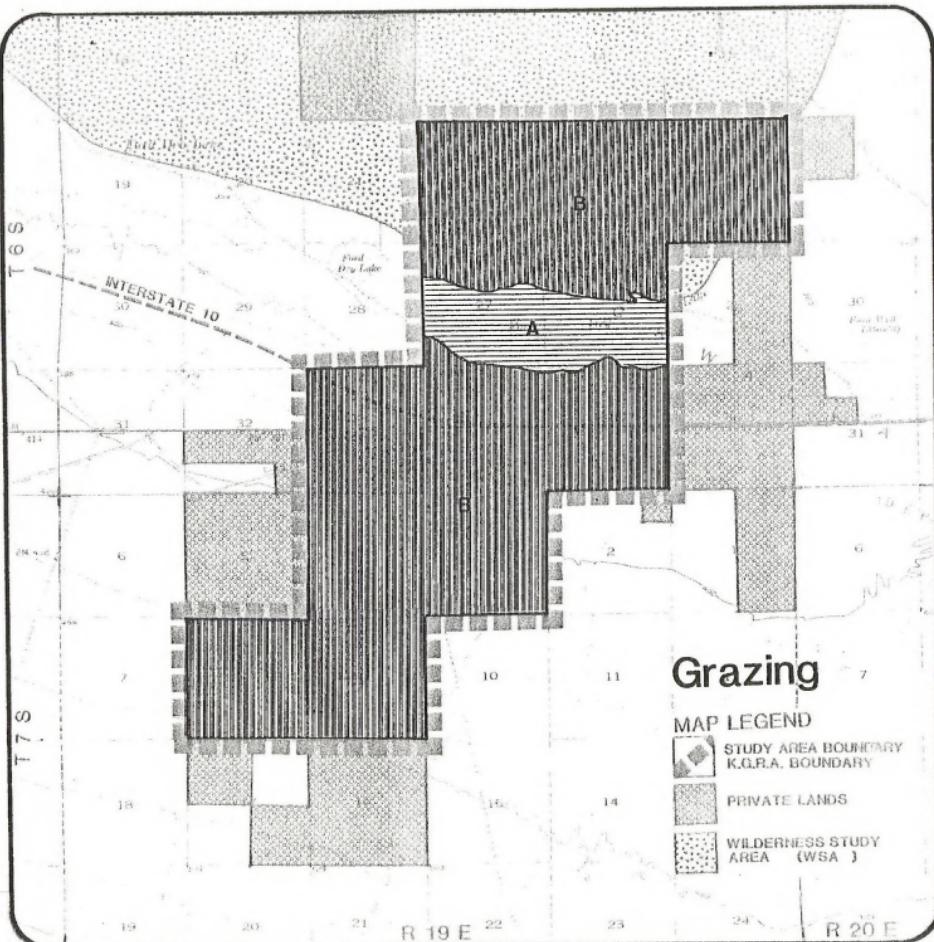
Map 4



Grazing

MAP LEGEND

- STUDY AREA BOUNDARY
K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



D. Human Values

1. Cultural Resources

Ford Dry Lake KGRA falls within the Chuckwalla Valley which has a relatively low overall site density, although pockets containing rather impressive archaeological resources do exist. These pockets most frequently center on current or former natural water sources, such as springs, natural tanks or dry lake beds (playas). The presence of Ford Dry Lake practically assures an unusual site density within the study area. The presence of unusual site and artifact densities around playa shorelines is a phenomenon observed over the entire California Desert. The archaeology of desert playas has become an important focus in the study of the history of the human species in the new world. Some of the earliest known human habitation sites in the new world are found around California's Pleistocene lakebeds, making it particularly important that special care be taken in managing these areas.

Prior to the inventory for this project, only four archaeological sites and one isolated archaeological occurrence were recorded within the study area. Two of these, Teague Well (Riv-1495) and Hopkins Well (Riv-1132) were historic. The third site (Riv-1131) consisted of a scatter of potsherds. The fourth site is a recorded aboriginal trail (Riv-343T). Four more sites were known immediately outside the boundaries of the study area. The inventory for this project produced three more prehistoric sites and 10 prehistoric isolated archaeological occurrences. The largest of these three sites (Riv-2159), located in Zone A, consists of five separate loci covering an area of approximately 2 square kilometers. Although it is a rather large site, the artifact density within the site is not high. The site contains manos, metate fragments, choppers, chopping tools, utilized flakes, hammer stones, cores, waste flakes, Tizon Brown Ware sherds, and a mano/hammerstone. The other two sites (Riv-2157 and Riv-2158), while smaller, contain similar artifact assemblages, including Tizon Brown Ware sherds, unidentified buff sherds, manos, metate fragments, abraders, chopping tools, hammerstones, waste flakes, a scraper plane, and cores.

Riv-2157 has been interpreted as a Late Prehistoric (post A.D. 900) temporary camp at which milling, vegetal material processing, and lithic tool production took place. Riv-1131 has been interpreted also as a Late Prehistoric site, consisting almost solely of ceramics. Riv-2158 has been interpreted as dating no earlier than the Pinto/Amargosa Periods (ca. 5000 B.C. - A.D. 900). Though no ceramics were found here,

the site may still be Late Prehistoric like the others. Riv-2159, interpreted as a temporary camp(s) at which milling, lithic tool production, and processing of animal and vegetal materials took place, may also date to the Pinto/Amargosa Periods with utilization continuing into the Late Prehistoric. (For more detailed information on these sites and Interpretations, See Cook, 1981).

In summary, the archaeological sites located within the study area indicate a series of temporary camps, probably primarily Late Prehistoric, but with some possibility of earlier use, at which generalized maintenance activities were carried out. The fact that no sites have been located away from the shoreline indicates that exploitation of lacustrine resources was the primary goal of the occupants of the camps.

For a more detailed description of the cultural resources present, See Cook, 1981. An overview of the study area is available in Warren, et al 1980. Other recent archaeological investigations in the study area are discussed in Gallegos, ed., 1980 and WESTEC Services, Inc., 1980.

The Ford Dry Lake Study Area has been zoned into areas of High, Medium, and Low Sensitivity. The following is the criteria used to determine those zones:

| | |
|---------------------------|---|
| <u>High Sensitivity</u> | areas contain archaeological materials of a unique, rare, or significant nature, or archaeological materials of a more common nature, but in unusual number. Environmental variables indicate the potential for additional material, beyond what is presently known, in un inventoried areas. |
| <u>Medium Sensitivity</u> | areas contain known archaeological materials of a common nature and/or in small numbers. Contains some potential, due to known environmental variables, for additional material in un inventoried areas. |
| <u>Low Sensitivity</u> | areas contain no archaeological materials, or very few or of a non-significant nature. Contains little potential for additional materials in un inventoried areas. |

The following are the zones and a summary of the significance of each zone. See Map 5 for location of zones.

Zone A - High sensitivity - Due to the fact that a rather large portion of the area contains cultural resources. This area also falls on or near a recessional shoreline that has a high probability of containing more cultural materials.

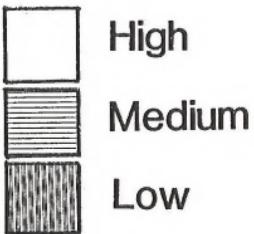
Zone B - Medium - Smaller sites were located here. This zone also contains part of the shoreline, and therefore could contain additional materials. However, the south shoreline does not seem to be as rich as the north shoreline.

Zone C - Low - Lakebed Area. Only 2 isolates were located in this area. Probability of significant cultural materials being located here is low.

Zone D - Low - No sites were located south of the freeway during the inventory. The probability for finding sites in this zone is extremely low.

FORD DRY LAKE GEOTHERMAL E.A.

Sensitivity Zones



Map 5

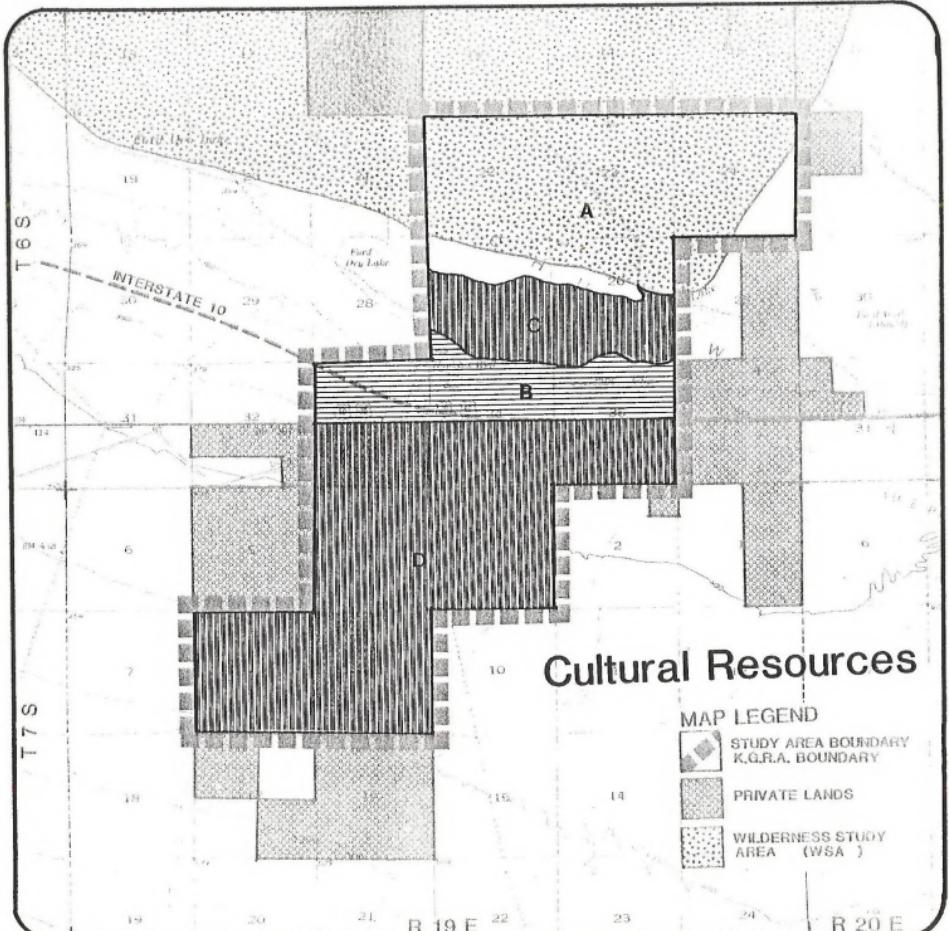


0 MILES
1
2

Cultural Resources

MAP LEGEND

- STUDY AREA BOUNDARY
K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



2. Visual Resources

The Visual Resource Management (VRM) Class for the area is III. This was derived during planning for the California Desert Plan. The Class III rating indicates that any actions in this area may begin to attract attention, but all changes should remain subordinate to the existing characteristic landscape.

The area is basically flat with gently sloping bajadas rising gradually to the mountains. Vegetation, both size and density, varies considerably throughout the area. In the vicinity of the dry lake, the vegetation is either so low or so sparse that it is visually insignificant. Shrubby deciduous tamarisk is abundant in the areas near the dry lake and creosote becomes the dominant species at the slightly higher elevations. Vegetation is most dense and larger in the washes where large specimens of Palo Verde and Ironwood can be found.

The relative flatness at the site is relieved only by the long bands of low (under 10') sand dunes north of the freeway and the shallow washes which transect the area in many places.

Interstate 10 bisects the site. This coupled with the relatively flat terrain of the study area enables motorists to see almost all portions of the KGRA. The large volume of traffic which this freeway supports results in an area that is sensitive to visual change.

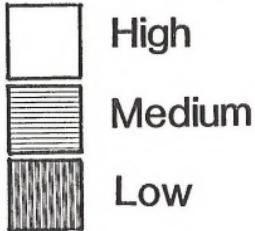
Visual intrusions in the study area include two gas line roads, two wood pole power lines and support roads in addition to the new Devers/Palo-Verde powerline and support road which is now under construction. A number of roads and ways of varying size and quality are located throughout the site.

The factors used in establishing sensitivity zones within the study area were the proximity of the freeway, user attitudes, and the existing low scenic values. As a result, a large portion of the site (approx. 5170 acres) has been rated as medium sensitivity and the remainder (approx. 2509 acres) as low sensitivity.

The medium sensitivity areas are the zones immediately adjacent to I-10 which have the maximum visibility from the freeway or have a greater variety/diversity of vegetation. Low sensitivity areas are zones more than one mile from the freeway which have low variety/diversity of vegetation and topographic relief. See the Visual Sensitivity Map (Map 6) for location of zones.

FORD DRY LAKE GEOTHERMAL E.A.

Sensitivity Zones

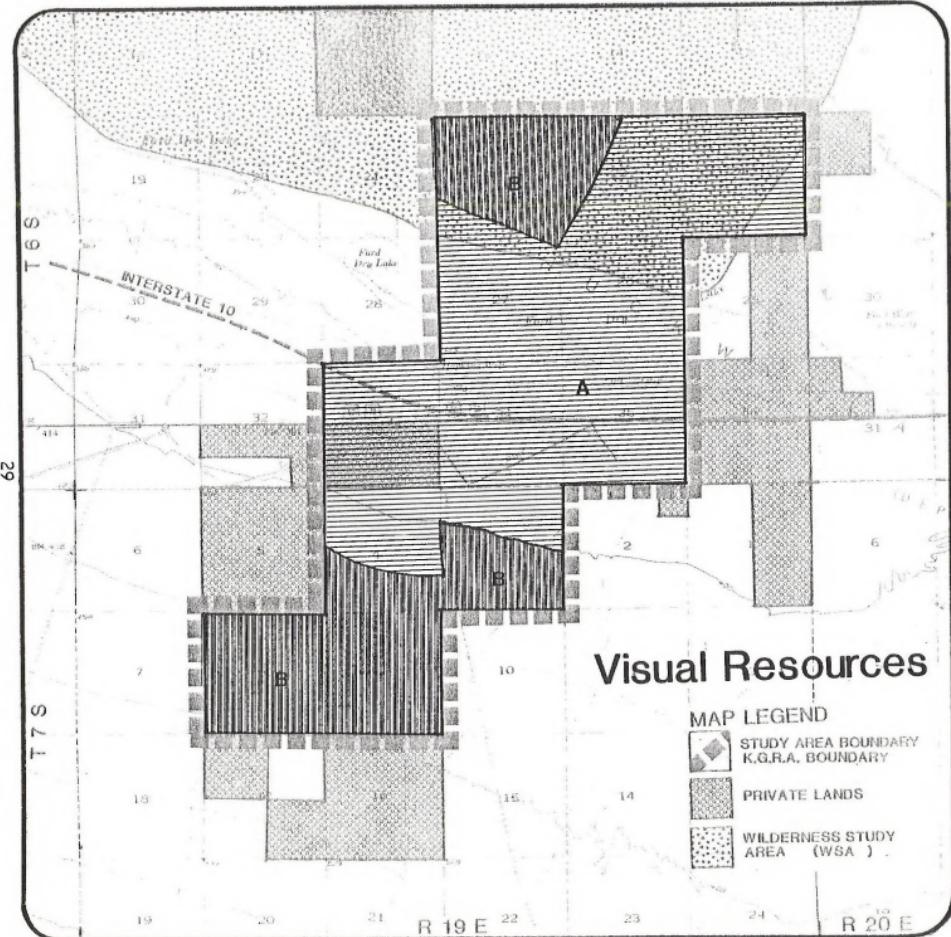


Visual Resources

MAP LEGEND

- STUDY AREA BOUNDARY
K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)

Map 6



3. Recreation

Recreation use of the area is low. Tracks in the sand and along utility line roads, in addition to occasional sightings of Off Highway Vehicles (OHVs) indicate use, but only to a minor degree. The general makeup of the study area when compared to other desert areas, provides little in the way of challenge or interest to vehicle oriented recreationists. It appears that the site's primary attraction for motorized recreationists is for access from the freeway to more desirable locations in the immediate vicinity. Some small game and bird hunting occurs within the study area. Portions of the site support native populations of rabbit, quail, and dove, and migrating waterfowl. Generally, the abundance of game is related to rainfall and the availability of water in the lakebed and washes.

Because of the low use of the majority of the study area by recreationist, most of the area has been rated as low sensitivity. This is due to the fact that the area has few opportunities for recreation and adjacent areas provide greater opportunities.

Portions of the study area have been rated moderately sensitive. These areas are zones in washes of dense vegetation that are capable of supporting wildlife in sufficient numbers to provide adequate hunting opportunities.

See Recreation Sensitivity Map (Map 7) for location of sensitivity zones.

4. Wilderness

The Northern portion of the study area has been recognized as having wilderness qualities and is part of Wilderness Study Area (WSA) 325. This means that the area met the minimum criteria defined in Section 2 (c) of the Wilderness Act of 1964. Although the area possesses the criteria, through multiple use planning decisions formulated during the Comprehensive Plan for the California Desert, the area has been recommended as non-suitable for further wilderness consideration. Congress, however, will make the decision on whether or not the area will be designated wilderness.

Until Congress acts on Wilderness Designations, all WSAs even ones thought to be non-suitable by BLM will require management to insure that no action on the land will impair the area's chances for wilderness designation. The BLM's Interim Management Policy Guidelines for lands under Wilderness Review and the multiple-use designation restrictions as defined in the California Desert Plan (April, 1981) define the activities which will be allowed.

FORD DRY LAKE GEOTHERMAL E.A.

Sensitivity Zones



High



Medium



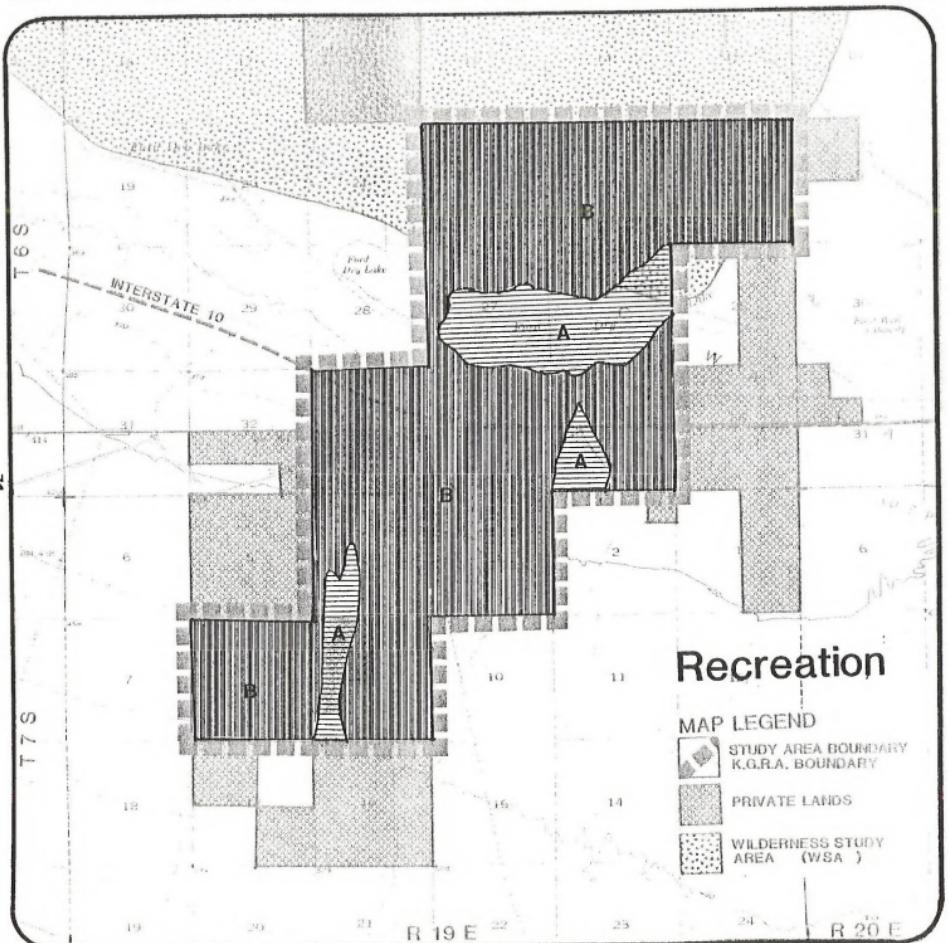
Low

Recreation

MAP LEGEND

- STUDY AREA BOUNDARY
K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)

Map 7



5. Land Use

There are eight existing and one proposed rights-of-way traversing the KGRA. The majority of the rights-of-way traverse the KGRA in a East-West direction and are concentrated in sections 33, 34, and 35 of T. 6 S., R. 19 E. The authorized use of these rights-of-way consist of gas pipelines, power transmission lines, Interstate 10, and the Chuckwalla road. See Map 8 for locations of roads.

During the early 1900's, all of the public lands within the study area were Desert Land Entries. The purpose of the Desert Land Entry Act was to encourage and promote reclamation, by irrigation of the arid and semi-arid public lands of the Western States. It is doubtful that any cultivation occurred on the majority of the leases because the majority of the leases were relinquished or cancelled by 1949. In order to become patented, land under a Desert Land Entry lease must have been under cultivation and irrigated within four years after the date of entry.

All of the patented lands shown on the study area maps were at one time under a Desert Land Entry lease and later patented except for:

NE 1/4 NE 1/4; Section 2 T., 7 S., R. 19 E., SBBM
SE 1/4 Section 17, T. 7 S., R. 19 E., SBBM

Ironically, on March 21, 1969, the lands within the boundary of the KGRA were classified by BLM order as non-suitable for agriculture.

The KGRA has been assigned a multiple-use designation of Class M during the planning for the California Desert. Class M is a Moderate use designation and allows for Geothermal Development under 43 CFR Section 3200 and 30 CFR 270 and 271 as long as NEPA requirements are met.

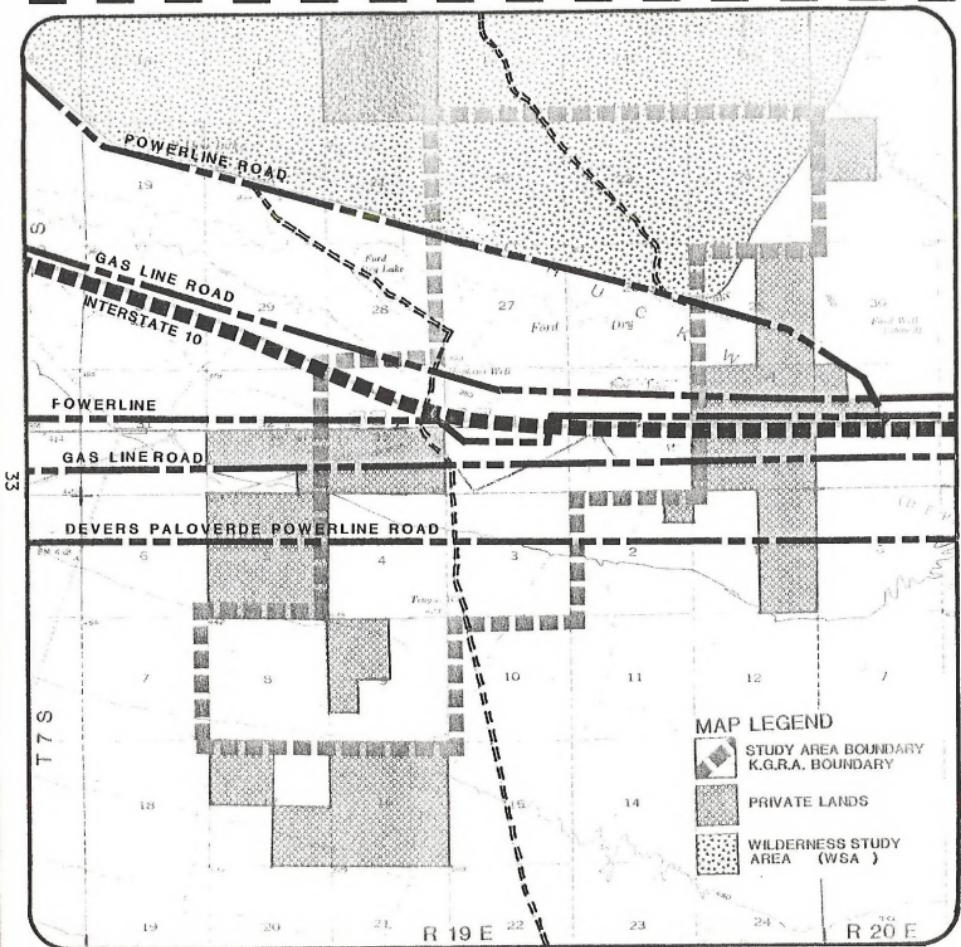
6. Socio-Economics

The study area lies within Riverside County's most sparsely populated census division. The County General Plan designates the land use classification in the area as "Water Problem" (Largely vacant, but including some recreational and agricultural use). The area is also identified as having no known dependable supply of domestic water.

The Blythe/Palo Verde area population (20,885 in 1978) is the only urban area within a considerable distance. Because the Blythe/Palo Verde area is the closest urbanized area to the

FORD DRY LAKE GEOTHERMAL E.A.

Utilities Access Roads



Map 8



0 MILES
1
2

study area and will undoubtedly provide services for geothermal development workers, its socio-economic aspects will be the major focus of this assessment.

The study area is located in the slowest growing census division in the county. It had a 7.8% growth rate over the last decade. The Blythe/Palo Verde census division experienced the second slowest growth rate of 11.1%. The City of Blythe has experienced a very slight decrease in population since 1970. The area is expected to continue in this slow growth rate trend through 1990.

Sources of water are ground water, the Colorado River Aquaduct and the Blythe Municipal Water District. California's water consumption from the Colorado River will be cut back to California's legal allotment in 1985. This action could restrict new demands on the use of water from the Colorado River Aquaduct and the Blythe Municipal Water District.

IV. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

A. Introduction

This chapter describes the unmitigated impacts which could result from implementation of the proposed action and alternatives. The impact assessment document below provides the basis for development of mitigation measures as defined in Chapter V.

Assessment of impacts were derived by using the following system:

Specialists took the sensitivity zones defined in Chapter III and combined them with the anticipated level of disturbance to come up with the environmental impacts for their resources. The following matrix was used:

TABLE IX

| | | LEVEL OF DISTURBANCE | | | | Environ- mental Impacts |
|-------------|---|----------------------|-------|--------|----|-------------------------------|
| SENSITIVITY | | High* | Med** | Low*** | No | |
| SENSE | H | H | H | M | No | |
| | M | H | M | L | No | |
| | L | M | L | L | No | |

Level of Disturbance

- *High
 - a) The resource value is destroyed in total; or
 - b) Damage is so extensive that the values will not recover in a lifetime (60 yrs.).
- **Medium
 - a) Heavily damaged (values are negated) but loss will heal in less than a lifetime (60 yrs.); or
 - b) Moderate damage (half the values intact) to the resource that diminishes quality, but will not recover in a lifetime (60 years).
- ***Low
 - a) Moderate damage (half the values intact) to the resource that diminishes quality, but will recover in a lifetime (60 years); or
 - b) Small portions of the values are significantly diminished or lost and will not recover in a lifetime (over 60 years). Most values are intact.

The anticipated impacts are defined graphically on maps at the end of each section. In addition, a summary chart is provided to show level of impacts by zone and also gives acreage impacted.

B. Non-Living Components

1. Geology

Proposed Action

There are no negative geologic impacts anticipated. Additional geologic and geotechnical knowledge gained during drilling and development would be a positive impact.

However, production and reinjection of geothermal fluids from and into subsurface formations could have an effect on surface subsidence or uplift and associated seismicity. Any such effects would be limited to the immediate area of the appropriate well. Such mass subsidence or uplift and associated seismicity is extremely improbable.

Fluid reinjection could induce seismicity or inhibit release of natural stresses triggering an earthquake. The East Mesa Geothermal reservoir has been monitored continuously since 1974 by a microseismic net capable of detecting earthquakes with magnitudes as low as 0 on the open ended Richter scale. This net has detected no seismic activity attributed to induced seismicity (Haskins, pers. comm, 1981). Based on this and the notable lack of earthquakes in the study area, the probability of induced seismicity is extremely remote.

Alternative 1

No significant impacts. However, new geologic knowledge would be unavailable.

GEOLOGY IMPACT SUMMARY

| Proposed Action and Alternative 1 | | | |
|-----------------------------------|--------------|-------|------------------------|
| Zone | Impact Level | Acres | Note |
| Total Area | None | 7680 | No impacts anticipated |

2. Hydrology

Proposed Action

Geothermal energy exploration and development, and the operation of a geothermal powered electrical generating plant will require the use of water. The only significantly large quantity of water used would be for cooling. The source for water would probably be the Chuckwalla Valley groundwater basin.

Koehler and Ballog (1979) evaluated 142 groundwater basins in the California desert as possible sources of cooling water for a 30 year, 1,000 megawatt fossil-fueled electric power generating station. The Chuckwalla Valley basin was one of the five basins judged suitable. Evaluation criteria included the existence of an adequate water supply (1,000,000 acre feet) and minimized impact on other water users within the basin.

A 50 megawatt geothermal powered electric generating station using fresh steam would require 750,000 gallons (2.3 acre feet) of groundwater. Steam condensed from the turbine exhaust feeding into the cooling towers would supply the remaining needed water. A binary system, using cooling ponds, would consume approximately 1,351 acre feet per year of normal operations.

Groundwater extraction will cause draw-down of the water table in the area. Most competing use of groundwater, however, is west of the study area near Desert Center, where the amount of draw-down will be less. Draw-down may reduce underflow to the Palo Verde Mesa.

If groundwater pumping is done within the proposed lease area near Ford Dry Lake, water quality will not be affected by a reversal of the groundwater gradient.

Potential deterioration of groundwater quality may result from leakage of geothermal fluids, or from inadequate disposal of water materials such as blow-down water from cooling towers. USGS Geothermal Resource Operation Orders, however, will minimize the risk of groundwater contamination.

Surface construction within the study area will cause some alteration of natural surface drainage. This impact is not expected to be serious.

The anticipated level of disturbance is determined to be low and that coupled with a moderate sensitivity rating for the area results in an anticipated low negative impact. This is due primarily to standard stipulations mandated by USGS Geothermal Resource Operation Orders.

HYDROLOGY IMPACT SUMMARY

| <u>Proposed Action</u> | | | |
|-------------------------|--------------|-------|--|
| Zone | Impact Level | Acres | Notes |
| Total Area | Low | 7680 | Due to some alteration of natural surface drainage |
| <u>Alternative 1</u> | | | |
| No anticipated impacts. | | | |

3. Soils

Proposed Action

Environmental impacts on soil will be low. This is determined by a low level of disturbance on a resource of moderate sensitivity. Soil impacts will result from displacement in some areas, compaction in other areas, and some accelerated erosion. It is assumed that about 586 acres (7.6%) of 3 lease areas will be directly impacted. The largest estimated area susceptible to intense compaction will be under the access roads (225) acres. Substantial compaction may also be expected on part of the 198 estimated acres which will be disturbed around well sites. Compaction may reduce potential for revegetation of disturbed areas. The compaction will be much more intense if soil is wet during the activity. Increases in water erosions will be limited by the well drained soils and flat terrain of the area. Loss of soil by wind erosion will be limited in depth by the strong aggregation of the playa soils and the coarse surface material of most of the sandy soils surrounding the playa.

Leasing areas in and around Ford Dry Lake will not impact any prime agricultural land. The potential croplands which could be impacted have limitations both in soil properties and water available for irrigation.

SOILS IMPACT SUMMARY

| <u>Proposed Action</u> | | | |
|-------------------------|--------------|-------|--|
| Zone | Impact Level | Acres | Notes |
| Total Area | Low | 7680 | Due to low amounts of displacement, compaction and accelerated erosion |
| <u>Alternative 1</u> | | | |
| No anticipated impacts. | | | |

4. Air Quality

Proposed Action

Minimal impacts to air quality are expected during the exploratory phases of development. The major impacts to air quality are expected to occur during the Field Development Phase, the Production and Operation Phase, and the Closedown Phase. The impacts will all be moderate in intensity due to the remoteness of the area.

During the construction of production facilities, impacts to air quality could occur due to exhaust emissions from internal combustion engines, possible well emissions, and dust. If Valley Fever spores are present, workers may be exposed to a significant hazard if they have no immunity.

During the Production and Operation phase, there may be increases in non-condensable gases, including CO₂, H₂S, NH₃, CH₄, and N₂.

CO₂ has been measured as 98% of all emissions at SDG&E's geothermal loop experimental facility near Niland. A local CO₂ increase may actually result in a local biomass increase.

While H₂S odor was not noticeable by BLM employees at the Niland plant, H₂SO₄ can combine with NH₃ to produce sulfate salt aerosols which can reduce visibility and cause a health decline.

The Closedown phase is expected to produce impacts similar to those of the Field Development phase, but of lesser magnitude.

At all phases, the operator will be required to comply with State and Federal laws governing air quality.

Air Quality Impacts Summary

| Proposed Action | | | |
|-----------------|--------------|-------|--|
| Zone | Impact Level | Acres | Note |
| Total Area | Medium | 7680 | Due to emission of non-condensable gases |

| Alternative 1 |
|-------------------------|
| No anticipated impacts. |

C. Living Components

1. Vegetation

Proposed Action

Impacts to vegetation are expected to occur during all phases of exploration, development, and operation. These impacts include:

- a) Damage or destruction to vegetation and disturbance of soil during off-road vehicle activity associated with initial exploration.
- b) Direct loss of vegetation due to surface disturbance during construction of roads, parking lots, drill pads, sumps, wells, and plant sites.
- c) Possible lowering of water table, decreasing water availability to vegetation.
- d) Possible damage to plants from wind-born or water-born pollutants.
- e) Possible decline in vigor of vegetation if disturbances reduce availability of water or nutrients to plants.

Exploration

Impacts to vegetation during exploration phase are expected to be minor, due to small size of machinery (truck-mounted drill rigs) and the presence of several dirt roads which provide access through much of the lease area. If vehicles are used off existing roads, impacts to vegetation will be greatest in areas with the highest native plant cover.

Construction

Approximately 7.6% of the lease area will be directly involved in construction activities associated with plant and well sites, roads, pipelines, and powerlines. Construction of the main power plant, wells, and access roads will result in direct losses of vegetation in which potential habitat will be removed for at least the duration of the geothermal operation. Construction of pipelines and powerlines will result in direct losses of vegetation, but habitat recovery around these facilities may begin after construction is completed.

Road construction causes indirect impacts which may have either negative or positive effects on vegetation. Negative impacts include habitat degradation by increasing chances of soil erosion, creating corridors of disturbance for invasion of exotic species (weeds), and altering local drainage patterns which can decrease water availability to some vegetation. Construction of new roads also increases access within an area to recreational vehicles. Use of desert areas by off-road vehicles can modify species composition and reduce cover and diversity of shrub species and annual wildflowers (See North Salton Sea EA for documentation).

A positive impact of road building may also occur. Larger, more vigorous shrubs, as well as a greater variety of annuals are found along paved and unpaved desert roads than in adjacent habitat (Johnson, et al., 1975). This is likely due to increased runoff toward road edges ("water harvesting"). However, the increase in biomass from this road-edge effect may not compensate for the net loss of vegetation throughout the entire right-of-way. In summary, road construction directly affects vegetation through long-term or permanent elimination of plants and their habitat within the right-of-way, and indirectly affects total production, species composition, density, and vigor of vegetation.

Powerline construction will result in direct loss of vegetation under power poles, and will cause temporary damage to vegetation between poles due to trampling by work crews. Recovery from powerline construction may occur as quickly as 30-40 years in areas of high productivity (Vasek, et al., 1975) or may require hundreds of years in areas of very low productivity.

Pipeline construction has the potential of causing low to high impacts on vegetation. If pipelines are constructed on the surface, low to moderate impacts may result from trampling and crushing of vegetation, but this disturbance should be only temporary. However, if pipelines are buried (as to reduce visual impacts), long-term changes could occur in soil and vegetation productivity and diversity (Clark, 1979). In creosote bush scrub communities similar to those around Ford Dry Lake, vegetation cleared from the immediate vicinity of a pipeline right-of-way has not recovered to predisturbance levels after 25 years (Clark, 1979).

All construction activities discussed above, including the movement of heavy equipment across unprotected desert soils, cause a more subtle disturbance than the apparent vegetation disruption. These activities can disturb both the soil crust covering desert soils and the black algal or lichen crusts common in the creosote bush scrub habitat around Ford Dry Lake. Soil crusts and algal-lichen crusts play a role in soil stabilization, erosion control, and water penetration in desert areas (Clark, 1979). Disturbance of soil crusts and algal crusts may accelerate wind and water erosion, and affect infiltration of rainfall and availability of nutrients to higher plants.

Atmospheric Emissions and Accidents

Possible impacts to vegetation from atmospheric emissions and accidental spillage of contaminants are discussed in the wildlife impacts section.

Agriculture

Since no agricultural crops are under cultivation within the lease area or in the immediate vicinity, the proposed action will have no affect on present agriculture. Future cultivation (as for jojoba plantations) may, however, be affected if geothermal plant operations result in a lowering of the water table, making less water available for future agricultural crops in the area.

Abandonment of Facility

Significant disturbance of vegetation will again occur when the site is prepared for abandonment, with impacts being similar in type and effect to disturbances during the construction phase. The success of revegetation within disturbed areas will depend upon degree of soil compaction and alteration, presence of toxic contaminants on the surface from spills or leaks, and productivity of original habitat disturbed.

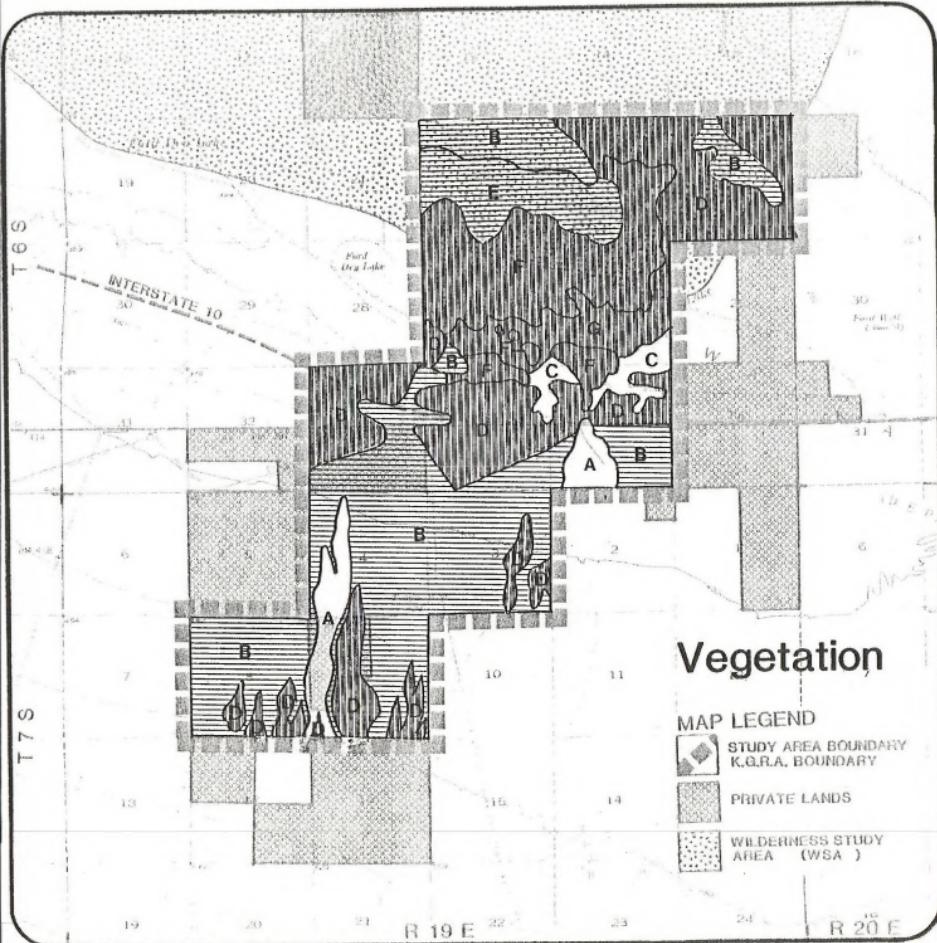
In summary, potential impacts to vegetation from the combined activities of a geothermal plant are rated as high if facilities are located within either the Ironwood/Palo Verde wash habitat or the Inkweed/Saltbush Scrub habitat. Potential impacts from the proposed action are expected to be moderate if facilities are constructed within either the Moderate Cover Creosote Bush Scrub habitat or the Low Cover Creosote Bush Scrub habitat with wind-blown sand. Impacts to vegetation are expected to be low if facilities are located within the Dry Lake Bed habitat, the Tamarisk Thickets, or the Low Cover Creosote Bush Scrub habitat with desert pavement. The decision criteria for these impact ratings appears in the following summary:

Vegetation Impacts Summary

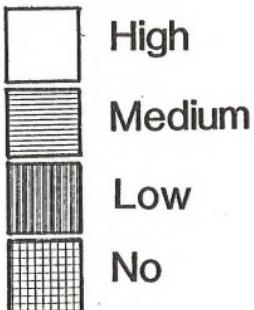
| Proposed Action | | | |
|-----------------|--------------|-------|--|
| Zone | Impact Level | Acres | Note |
| A | High | 460 | Due to high productivity, small area |
| B | Moderate | 2830 | Due to moderate cover & diversity, but large acreage |
| C | High | 230 | Due to small acreage of uncommon plant assemblage |
| D | Low | 1890 | Due to large acreage & lower diversity & plant cover |
| E | Moderate | 500 | Due to small acreage with moderate cover & diversity |
| F | Low | 1420 | Due to low diversity, exotics present, & large acreage |
| G | Low | 350 | Due to low diversity & cover of perennial plants |

| Alternative 1 |
|-------------------------|
| No anticipated impacts. |

FORD DRY LAKE GEOTHERMAL E.A.



Impacts



Map 9



Vegetation

| MAP LEGEND | |
|------------|--|
| | STUDY AREA BOUNDARY K.G.R.A. BOUNDARY |
| | PRIVATE LANDS |
| | WILDERNESS STUDY AREA (WSA) |



2. Wildlife

Proposed Action

General

Impacts to wildlife are expected to occur during all phases of the proposed project. These impacts will include:

- a) Direct loss of habitat due to construction of roads, pipelines, well and plant sites.
- b) Disruption of wildlife behavior and possible physiological changes caused by an increase in noise levels.
- c) Mortality and habitat degradation due to pollution.
- d) Mortality and disruption due to increased harrassment and vehicular travel on and off road.

Exploration

Impacts during the preliminary exploration phase are expected to be relatively minor. There are a number of existing roads in the lease area which provide fairly good access. Where off road travel is necessary impacts will be higher in those areas where plant and animal densities are highest. As a hunted population, waterfowl present on the lake would be most sensitive to vehicular travel and human disturbance. Exploration activity would also be particularly disruptive during the spring months when migrating birds boost local densities and resident populations are in the midst of breeding.

Construction

As development progresses, impacts will become increasingly severe and localized. Approximately 7.6% of the lease area will be directly involved in construction activities, including the area for roads, pipelines, well and plant sites. Many reptiles and rodents inhabiting the construction site will probably be killed during the initial clearing. Larger mammals and birds will be displaced to nearby areas. They may become subject to increased predation, and stress and therefore be lost indirectly.

The construction of roads will have indirect impacts on habitat and has been discussed under Section C - 1 Vegetation (Construction).

Pipelines resting on the ground could reduce the mobility of small animals, thereby affecting foraging, reproduction, and social behavior. A reduction of vigor may occur due to the limiting the gene pool in confined populations. To a limited extent, the construction of roads can have a similar impact.

The construction of new powerlines in the area may result in some additional bird mortality due to electrocution and collision. This may be especially true around the lake as normally higher flying waterfowl and shorebirds descend to the lake.

Noise

Noise will impact wildlife primarily during the development and production phases although some impacts are expected in all phases. Noise may drive away animals, cause physiological stress and damage, and interfere with auditory cues and interspecific communications.

Noise will have unfavorable effects on wildlife near power generating sites and well heads. Noise can cause damage to animal hearing at levels expected in the operation of a geothermal plant (Mellow, as cited in Stebbins, 1974). Smaller animals seem to be more susceptible to noise and less able to adjust. Larger animals tend to habituate although they too may suffer some hearing loss (USFWS, 1978).

Noise may also disrupt social and reproductive functions of birds that rely on auditory signals. It may alter predator-prey relations to one or the other's disadvantage. The highest impacts would occur during spring and early summer and in those areas with higher wildlife densities.

Waterfowl on Ford Dry Lake, as a hunted population, are particularly sensitive to human intrusion. A sudden increase in noise levels may result in a startle reaction driving birds from the lake. One instance of startle reaction has been recorded at the Salton Sea National Wildlife Refuge involving Snow Geese. After direct venting at a plant approximately 2-3 miles away, the flock flushed and left the area (Dean, Salton Sea National Wildlife Refuge Manager, pers. comm.).

Pollution

Non-condensable gases vary widely from field to field. The actual chemistry of the geothermal brine at the Ford Dry Lake KGRA will not be known until it is drilled and sampled. If a binary system is utilized, no gaseous emissions are expected as the system is entirely closed. However, if a flash steam

steam system is used, carbon dioxide (CO_2), hydrogen sulfid (H_2S) and mercury (Hg) could occur. Carbon dioxide, hydrogen sulfid, and mercury are usually found in concentrations that are essentially non-toxic to wildlife. All other gases generally emitted are, essentially inert or are highly unlikely to affect natural ecosystems in the quantities and forms emitted by a geothermal plant (USFWS, 1978).

Accidents

Although all geothermal water will be reinjected, the possibility of an accident (broken pipeline, blowout, etc.) requires the discussion of liquid geothermal emissions. Geothermal solute varies as much as geothermal gases from field to field and well to well. In a study done by USFWS (USFWS, 1978) on the water of 96 hot springs and more than 41 geothermal wells all but 4 contaminants were found to be at toxic levels in at least one of the samples. The exact solute composition of the geothermal waters at Ford Dry Lake is unknown, but to be prudent, the geothermal water will be considered toxic.

Pipeline breaks would probably result in only localized impacts as they can be controlled by simply shutting down the well. The extent of the spill would depend on flow and duration. If geothermal water contaminated the lake when water was present, toxic components and the increase in temperature could kill aquatic plants and invertebrates and poison waterfowl. Even if water was not present in the lake bed at the time of an accident, geothermal brine could endanger the survival and development of encysted stages of invertebrates awaiting the next inundation. Localized contamination of the lake bed could be spread through the lake when water returns, affecting invertebrates and waterfowl. Various contaminants may cause a decline in vigor or vegetation, death of affected plants, or may decrease or inhibit germination of new plants.

A blow-out would cause similar impacts to vegetation, although the difficulty of controlling this type of accident would increase the severity of impacts. Blow-outs excavate craters, producing dust and silt, and thus are capable of substantially altering soil systems, while covering vegetation with silt and geothermal brine containing various contaminants. The resulting loss in wildlife and/or habitat would be dependent on the location, duration, and volume. The lake again would be most sensitive although loss in other habitats would occur compensatory with their sensitivity rating.

Indirect Impacts

Impacts to wildlife can be expected to occur from the use of vehicles on and off roads and the increased human presence in the area.

Impacts from the use of vehicles off road have been addressed in detail in the North Salton Sea Geothermal EAR (USDI, BLM, 1979). In summary, these impacts include; reduction of shrub density, reduction of canopy cover of individual species, reduction of the diversity of shrub species of selectively impacting the smaller, more fragile species, reduction in diversity of both annual and perennial herbaceous species, reduction in the numbers of annual wildflowers that will germinate and flower the following years, and increases in weedy species.

Human activity will have the greatest impact in areas with high wildlife values, particularly the lake, when water is present and the Ironwood Wash systems during migration and breeding seasons. Waterfowl and shorebirds are particularly prone to flush and may leave the area. Hunting pressure may increase because of additional people in the area in conjunction with geothermal production.

Species of Special Significance

Impacts to desert tortoise are expected to be low because of the extremely low numbers within the KGRA. The developed area will be severely degraded as potential habitat. Not only will disturbed areas require a long time to return to preoperation condition, if ever, but the presence of additional roads will adversely affect the suitability of the area to support tortoises. (Berry and Nickolson, 1979.)

Impacts to those birds on the Audubon Society's Blue List will be essentially those discussed under General Impacts. Noise and human presence will be primary impacts. Accidental contamination of Ford Dry Lake could result in some mortality and the abandonment of the lake.

Couch's spadefoot toad has been mentioned because of its particular sensitivity to noise. Brattstrom and Bondello in 1979 found that the sound of motorcycles alone at 95 dBA, (no lower sound limit was established), prompted the toads to emerge from the ground. Dehydrated toads would be lost if prompted by sounds of nearby geothermal development to emerge when water and food are not available.

FORD DRY LAKE GEOTHERMAL E.A.

Impacts



High



Medium



Low



No

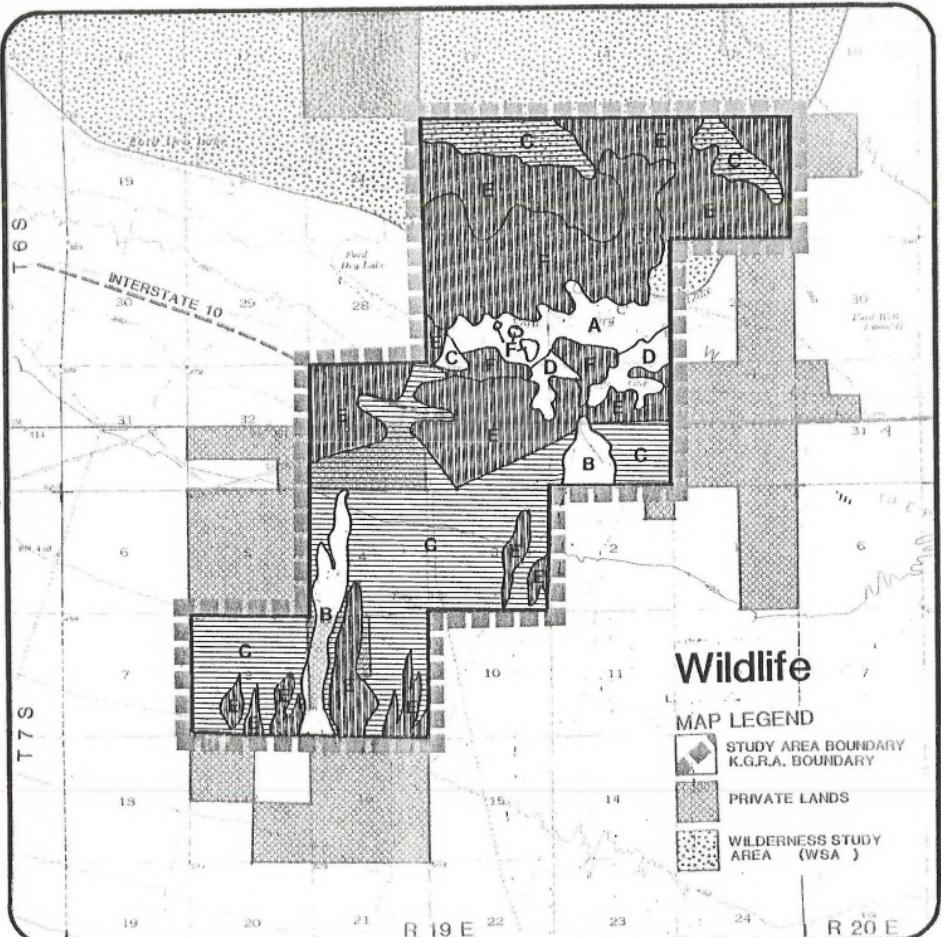
Map 10



Wildlife

MAP LEGEND

- STUDY AREA BOUNDARY
- K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



Wildlife Impact Summary

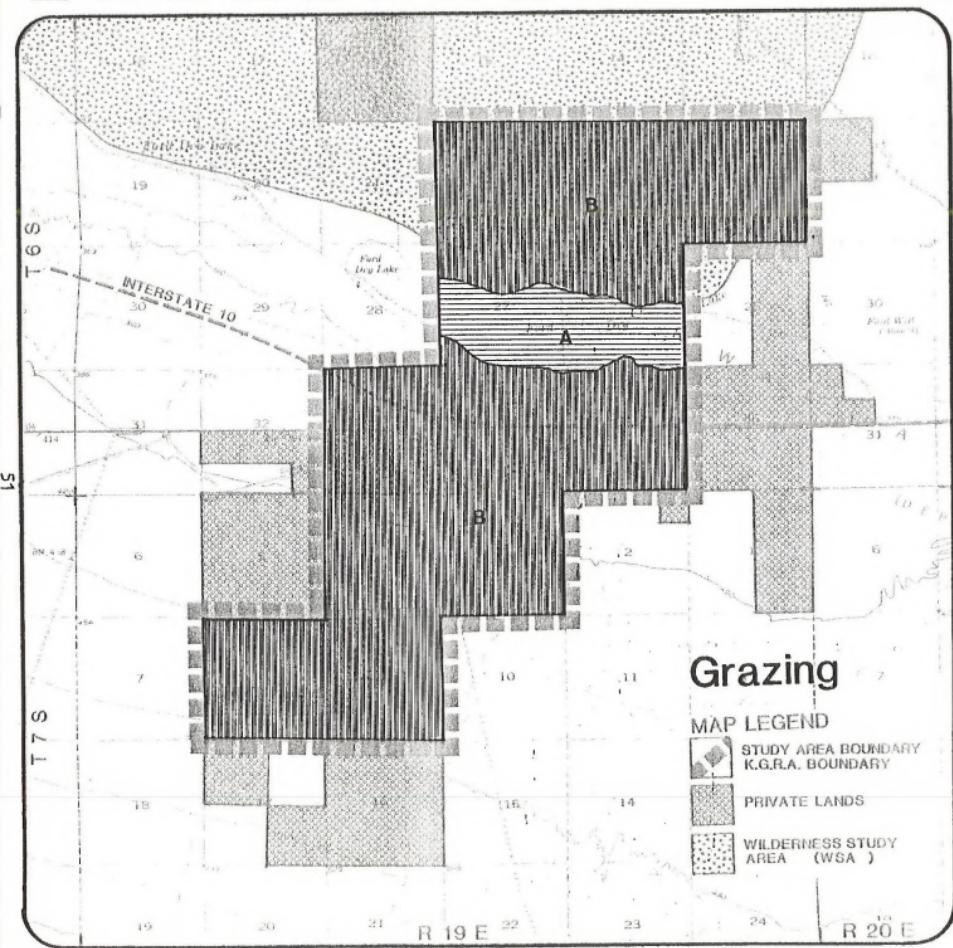
| Proposed Action | | | |
|-----------------|--------------|-------|--|
| Zone | Impact Level | Acres | Notes |
| A | High | 350 | Due to possibility of total loss |
| B | High | 460 | Due to possibility of total loss |
| C | Moderate | 2830 | Only 583.68 acres could be totally impacted |
| D | High | 230 | Due to possibility of total loss |
| E | Low | 2390 | Only 583.68 acres could be totally developed |
| F | Low | 1420 | Only 583.68 acres could be totally developed |

| Alternative 1 |
|-------------------------|
| No anticipated impacts. |

3. Domestic Animals - Grazing

The proposed geothermal project is not expected to have a high impact on local livestock. Initial well venting and cleaning, if very close may cause some stress, however, this will be temporary. Animals should habituate very quickly to operational noise levels.

There will be some loss of forage for sheep due to physical displacement and also due to surface sterilization from overflow of salt material. There is also an increased chance of sheep road kills as newly constructed access roads penetrate into portions of the site previously unused by vehicles.



FORD
DRY LAKE
GEOTHERMAL
E.A.

Impacts

High

Medium

Low

No

Grazing

MAP LEGEND



**STUDY AREA BOUNDARY
K.G.R.A. BOUNDARY**



PRIVATE LANDS



WILDERNESS STUDY AREA (WSA)

Map 11



0
MILES

Grazing Impact Summary

| Proposed Action | | | |
|-----------------|--------------|-------|--|
| Zone | Impact Level | Acres | Notes |
| A | Moderate | 640 | Due to presence of important annual forage that would be destroyed |
| B | Low | 7040 | Due to loss of such a small percentage of this specific range type |

| Alternative 1 |
|-------------------------|
| No anticipated impacts. |

D. Human Values

1. Cultural Resources

Impacts

Proposed Action

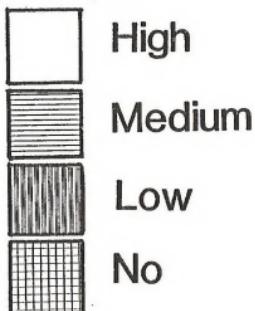
For purposes of assessing impacts, a high level of action was assumed in all cases since this alternative allows for development of all areas of the lease. A second major assumption is that any level of action, if it results in ground disturbance at an archaeological site, will result in destruction of that site, although scientific data collection can mitigate these impacts.

Zone A has been given a high rating for impacts due to the known presence of a particularly large, though not dense, site area containing five different loci. Since two recessional shorelines, which may contain additional sites, run through Zone A, there is a distinct possibility for further as yet undiscovered cultural material.

Zone B has also been given a high impact rating, even though this zone does not appear to be as rich in cultural resources at the northern shoreline (Zone A). This situation occurred primarily because a combination of medium sensitivity with a high level of action results in a high impact rating. The resource potential of Zone B does not appear to be as significant as Zone A.

FORD DRY LAKE GEOTHERMAL E.A.

Impacts



Map 12

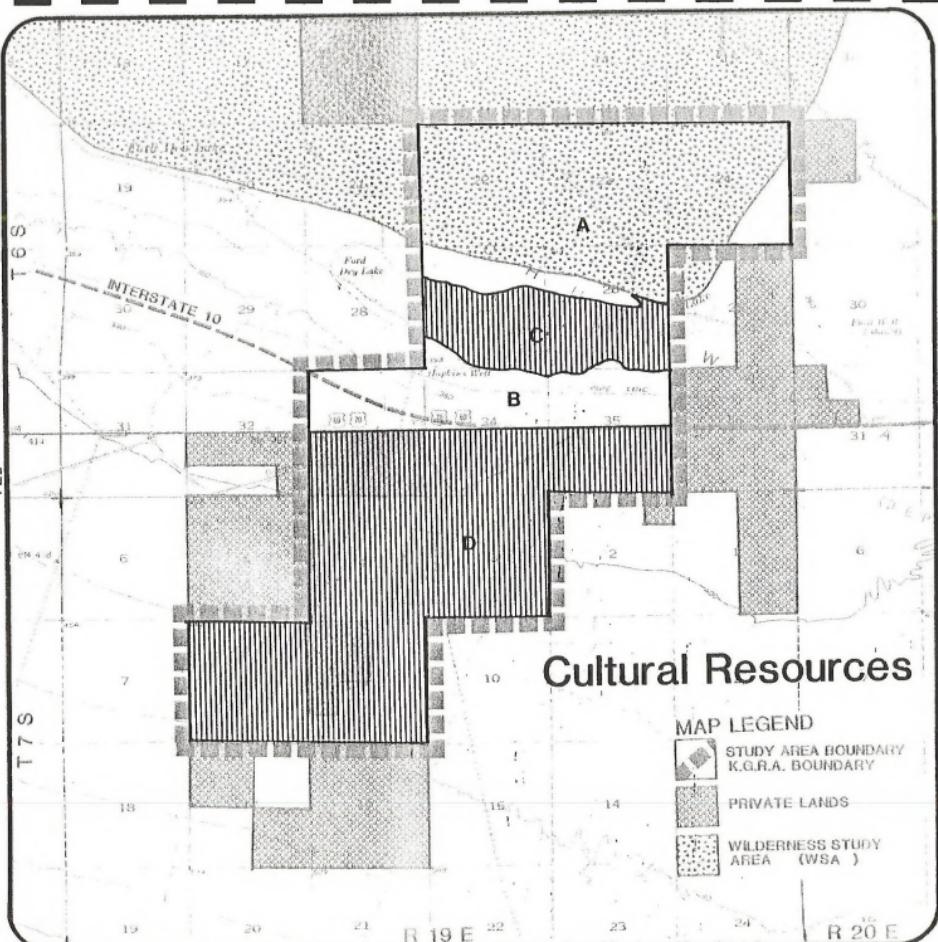


0 MILES
1 2

Cultural Resources

MAP LEGEND

- STUDY AREA BOUNDARY
- K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



Zone C and D, both areas of low sensitivity, have been given medium impact ratings through the assumption of a high level of action. Although the possibility of any cultural resources in either of these zones is slim, any level of action that affected cultural resources would result in permanent loss of the sites.

Indirect Impacts

Indirect impacts to cultural resources might be expected in Zone A as a result of people, brought into the study area for construction/maintenance of the geothermal facilities, exploring those areas not actually leased. The fact that a road runs to the major site area in Zone A leaves it particularly vulnerable.

Cultural Resources Impact Summary

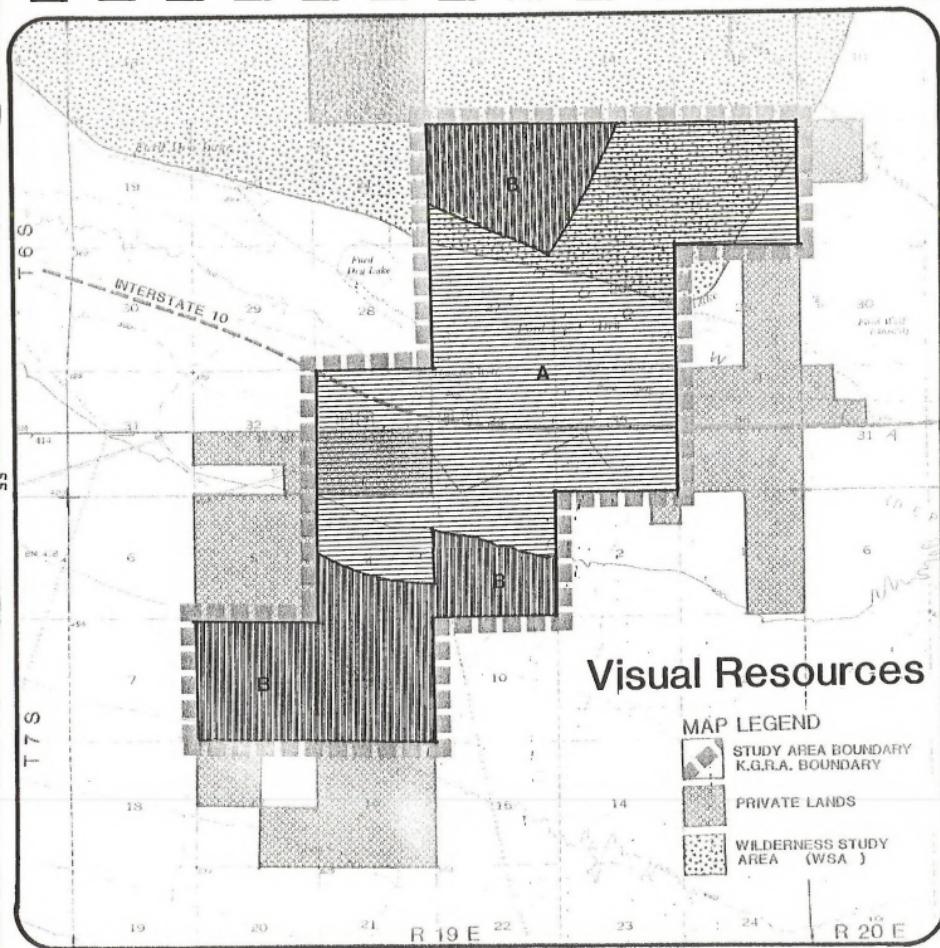
| Proposed Action | | | |
|-----------------|--------------|-------|---|
| Zone | Impact Level | Acres | Note |
| A | High | 2700 | Due to large (but not dense) artifact scatters and presence of recessional shoreline. |
| B | High | 960 | Due to presence of archaeological sites |
| C | Moderate | 820 | Any level of action will destroy sites. However, possibility for sites is low |
| D | Moderate | 3200 | Any level of action will destroy sites. However, possibility for sites here is low |

| Alternative 1 |
|-------------------------|
| No anticipated impacts. |

2. Visual Resources

Proposed Action

Construction of geothermal facilities will result in a variety of visual impacts to the area. Removal of native vegetation and the construction of buildings, towers, pipe lines, powerlines,



FORD
DRY LAKE
GEOTHERMAL
E.A.

Impacts



High



Medium



Low



No

Visual Resources

MAP LEGEND



**STUDY AREA BOUNDARY
K.G.R.A. BOUNDARY**



PRIVATE LANDS



WILDERNESS STUDY
AREA (WSA)

Map 13



0
MILES

1

2

and ponds in addition to other support requirements will impact the site. These changes will alter the existing form, line, color, and texture of areas within the study site. The degree of impact will vary with location and will range between medium and low.

The impacts were derived by conducting contrast ratings on representative areas from the freeway which is the primary observation point.

Visual Resource Impact Summary

| Proposed Action | | | |
|-------------------------|--------------|-------|--|
| Zone | Impact Level | Acres | Note |
| A | Moderate | 5170 | High visibility, flat, insignificant vegetation |
| B | Low | 2510 | Distance, increased topographic variation and vegetation |
| Alternative 1 | | | |
| No anticipated impacts. | | | |

3. Recreation

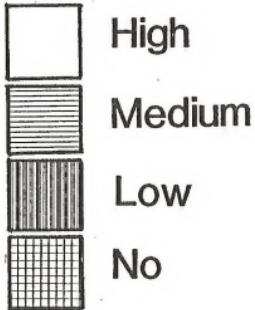
Proposed Action

Geothermal development in the area will displace some existing OHV use, but the site will continue to support some degree of current activity. Construction of roads supporting the geothermal operation will open additional areas to OHV use. Overall the impacts to motorized oriented recreation will be low.

The location of geothermal equipment and support facilities in the vicinity of the dry lake or washes would displace wildlife and generally reduce hunting opportunities in the area. Not only would the number of small game and birds be reduced, but the quality of the hunting experience would suffer. The impacts resulting from this have been determined to be medium.

FORD DRY LAKE GEOTHERMAL E.A.

Impacts



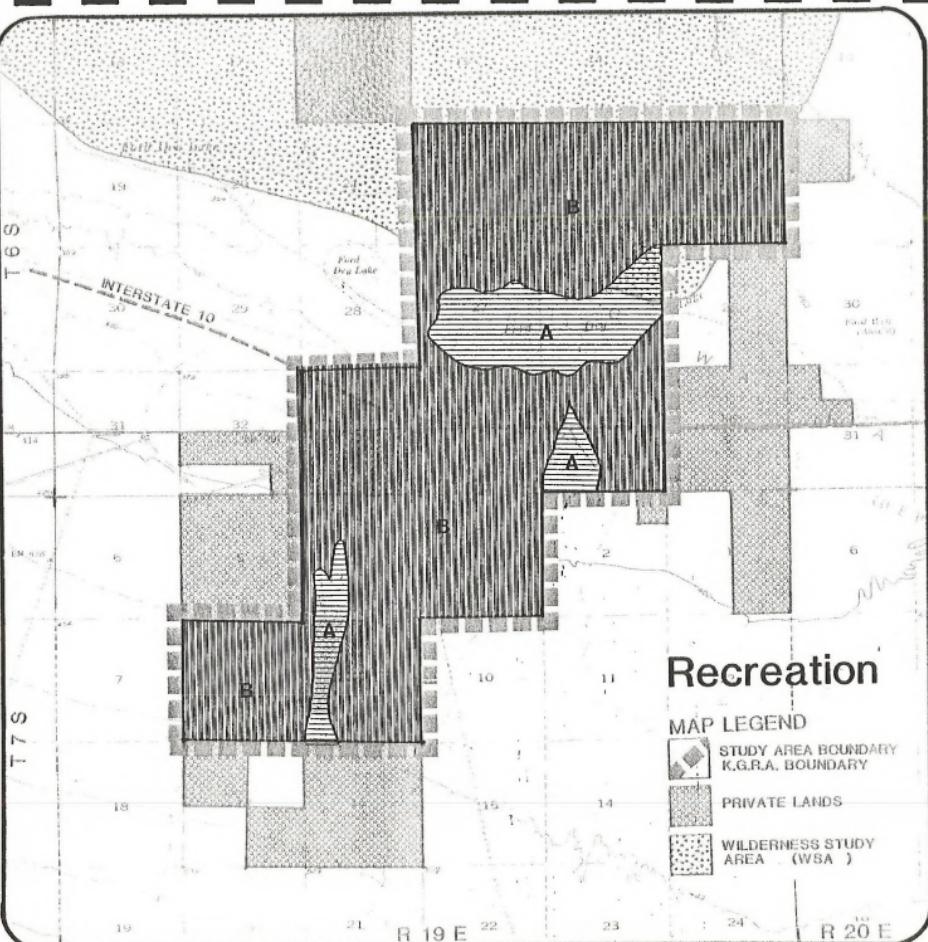
Map 14



Recreation

MAP LEGEND

- STUDY AREA BOUNDARY
K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



Recreation Impact Summary

| Proposed Action | | | |
|-----------------|--------------|-------|------------------------------|
| Zone | Impact Level | Acres | Note |
| A | Moderate | 865 | Small game habitat |
| B | Low | 6815 | Low numbers of recreationist |

Alternative 1

No anticipated impacts.

4. Wilderness

Proposed Action

That portion of the study area within the Wilderness Study Area (WSA) must be managed so as to not impair the wilderness values of the WSA as a whole. However, some diminishment of wilderness qualities could occur since noise and visual impacts deter from opportunities for solitude. Since the area must be managed for non-impairment, overall impacts are judged to be low.

Wilderness Impact Summary

| Proposed Action | | | |
|-----------------|--------------|-------|---|
| Zone | Impact Level | Acres | Notes |
| WSA | Low | 2700 | Due to possibility of diminished wilderness qualities |

Alternative 1

No anticipated impacts.

5. Land Use

Proposed Action

One of the concerns brought up at the public workshop in Blythe was that the people present wanted assurance that their normal routes of travel, to their land would not be obstructed by the geothermal plant. A standard stipulation defined in the geothermal lease form insures that their access will not be denied.

Alternative 1

No anticipated impacts.

6. Socio-economics

The proposed action should be consistent with the prevailing public sentiment of pro growth and for environmentally clean sources of energy.

A beneficial impact of increased property taxes would be derived by geothermal development. An analysis for a similar geothermal proposal in Imperial County, published in 1980 indicated that property tax revenues for a 50 MW plant would be approximately \$250,000.00 per year based on an assumption of \$5,000.00 in taxes for each megawatt (Imperial County Geothermal Element). Tax revenues prior to development of the power plant would be negligible. Additional costs to public agencies to provide service to people employed by the project would be negligible. (Employment impacts have been based on the environmental impact report for the proposed Heber Geothermal Demonstration Project VTN, 1978.)

Table XXI shows employment associated with the development model. Due to the specialized nature of the work, most of the employment would go to people outside the county, thereby not directly reducing the county's unemployment. Since as much as 75% of the employees prior to the production and operation stage would come from outside the county, they would constitute an increase in demand for motels and rental housing. This increase might not be noticeable except during the winter tourist season when temporary quarters are in demand. The effect would be a possible contribution to higher rental and motel rates in the nearby communities. If extensive geothermal development results from this action, its impact on the housing (temporary or permanent) would correspondingly be greater.

Employment for Model Lease (A Single
50 MW Facility)

| | Number of Employees | Duration |
|--------------------------|------------------------|-------------|
| Preliminary exploration | 6-10 | 6 months |
| Exploration drilling | 20 | 1 year |
| Field development | | |
| Well drilling and | | |
| pipeline construction | 105 | 1 year |
| Plant construction | 110 | 1-1/2 years |
| Electrical transmission | | |
| line | 20 | 3 months |
| Production and Operation | 20 | Operation |

Rental fees received from issued leases would be \$1.00 per acre per year. Fifty percent of these fee payments would be returned to the State of California. When any lease enters the production stage, an initial royalty of 10% will be paid on production, again 50% will be returned to the state.

The Federal Land Policy and Management Act of 1976 (FLPMA) suggests that rentals and royalties distributed to states are to be used to offset impacts to communities where the mineral development is occurring; however, the states are free to use these monies in any way they may choose. State of California Assembly Bill 1300, July 1980, requires all monies received by the state for geothermal rentals and royalties be returned to the county of origin.

Alternative Action #1

A decision not to lease the study area for geothermal development could have a deleterious effect upon the potential economic growth of Riverside County. An increase in available electricity could stimulate growth of light industry in the Palo Verde area. This would lead to increased employment and diversity of the local economic base.

Non-development of the geothermal resource would negate the approximately \$250,000.00 per 50 MW plant, of public tax dollars which could be made available for support of public facilities such as: schools, fire and police protection, water and sewer, electricity, etc., county-wide.

V. MITIGATION MEASURES

A. Introduction

This chapter lists certain measures to mitigate the environmental impacts discussed in the previous chapter. These measures represent a commitment on the part of the Bureau of Land Management and the lessee that the proposed action will not be implemented without the specified mitigating measures.

It is BLM's intention that the Ford Dry Lake EA be the basic reference document for the design of surface protection features within the lease area. Therefore, the lessee will be required in his plan of operation to refer to activities in the appropriate sections of this EA.

There are already numerous requirements for geothermal resource usage. These are found in the Geothermal Resource Operational Orders (GROs) 1-7. Of primary interest is GRO-4 which lists existing requirements for environmental protection. GRO-4 is summarized below:

Protection of the environment includes the lessee's responsibility to: conduct exploration and development operations in a manner that provides maximum protection of the environment; rehabilitate disturbed lands; take all necessary precautions to protect public health and safety; and conduct operations in accordance with the spirit and objectives of all applicable Federal legislation and supporting executive orders.

The operator is required by GRO-4 to reduce visual impacts by careful design, careful location of facilities and careful use of color; to design operations to use the least land possible; to use existing roads where feasible; to reclaim and revegetate lands; to maintain lands in a safe and clean condition; to not interfere with other leases, permits, or authorized uses; to allow free and unrestricted public access except where needed to protect public health and safety; and to preserve recreational uses through careful site selection and design. GRO-4 also requires erosion and slope control; protection of plant and wildlife; protection of cultural resources; prevention of subsidence and seismicity through initial surveys, monitoring cooperation, and reinjection; and noise abatement. Also required by GRO-4 is prevention of pollution by proper disposal of solid and liquid wastes; lining of pits and sumps with impervious material; maintenance of facilities in safe condition; and measures to meet federal, state, and local air quality requirements.

B. Recommended Mitigating Measures

The following recommended mitigating measures are designed to supplement existing requirements. They are appropriate for implementation at the operational stage.

1. The BLM District Hydrologist will monitor wells on public domain to determine what effect geothermal leasing is having on them. Remedial actions will be required if needed.
2. During the preliminary exploration phase, portable mud pits for drilling mud will be used.
3. Noise during construction and operation shall be kept to a minimum during February through June (the breeding season). dBA levels will be set by the Supervisor in consultation with the BLM and the lessee.
4. No surface activities shall be allowed within 1/2 mile of the dry lake bed when water is present to reduce impacts to wildlife.
5. No pipelines or wellheads shall be constructed within 1/2 mile of the dry lake bed.
6. Surface activities will be strongly discouraged by BLM in areas shown in this EA to have high sensitivity and anticipated high residual impacts. Surface activities in these areas will be allowed only if the operator makes an overwhelming show of need, that resource values can be mitigated to BLM's satisfaction, and that their proposed surface activity cannot be relocated.
7. Protective barriers shall be placed around and over sumps to prevent wildlife and livestock from entering.
8. Pole designs and arrangements of wire will follow the suggestions outlined in the Rural Electrification Bulletin (1975), or those of the Raptor Research Foundation (1975). This will reduce losses of raptors and other birds to electrocution.
9. Revegetation or reseeding shall use species native to the study area.
10. The use of herbicides will be prohibited.
11. Structures and support facilities, where possible, will have non-specular surfaces to reduce glare and reflection. Colors will be selected to blend with the surrounding environment.
12. Condensed steam or non-geothermal water shall be used for cooling to reduce tower drift problems.

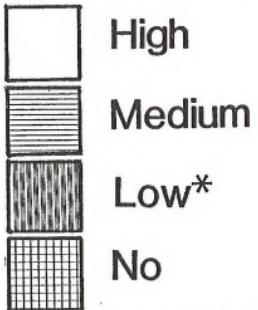
13. All personnel working within the study area in any capacity must be instructed that cultural resources are protected under the 1979 Archaeological Resources Protection Act, and that theft or destruction of cultural resources on public lands can result in fines and/or imprisonment. BLM may elect to post notices to this effect in a conspicuous place on the site.
14. Prior to any ground disturbing activity, all leased areas must be inventoried at a 100% level for cultural material. Any sites located must be fully recorded on BLM site record forms, mapped (micro-mapped if warranted) and photographed at BLM's discretion. Recorded sites will be properly collected and curated following standard scientific procedures. This work must be carried out at the leasees expense and must be conducted by archaeological consultants who hold currently Valid Antiquities Act Permits.
15. Maintenance of roads shall be the responsibility of the leasee unless otherwise specified. A regular maintenance program or upgrading of existing roads such as, but not limited to ditching, draining, culverts, graveling, or capping of the road bed may be required.
16. The use of existing roads or trails for any purpose other than casual use as that term is defined in 43 CFR 3209.0-5 and the construction of all new roads necessary for the exploration of the lease lands shall receive prior approval by the Area Geothermal Supervisor (USGS) and the BLM. Road standards and construction methods employed will be set forth in a plan of operation in accordance with 30 CFR 270.34.
17. Routes needed for construction, but not required for normal operation should be regraded and replanted as soon as possible.
18. The mainline road should be gravelled or paved to reduced dust from passing vehicles and wind erosion. This will be stipulated at the Plan of Operation stage, in cooperation with the USGS.
19. Construction sites will be sprinkled with uncontaminated water to minimize wind erosion of soil and dust.
20. Road and trail construction will not block major existing drainage.
21. Soil should be replaced in excavated areas after abandonment of the site. This will be stipulated at the Plan of Operation stage, in cooperation with the USGS.
22. After abandonment, compacted soils shall be ripped to a depth of 18 inches.

VI. SUMMARY OF ANTICIPATED IMPACTS AFTER MITIGATION

| Resource & Alternatives | Zones | Acreage | Impacts Before Mitigation | | | | Mitigation Measures | Notes | | | |
|---|------------|---------|---------------------------|------------|---|--|---|-------|--|--|--|
| | | | Impacts After Mitigation | | | | | | | | |
| | | | | | | | | | | | |
| Geology Proposed Action Alt 1 | Total area | 7680 | No | No | None | None | No impacts anticipated No impacts anticipated | | | | |
| Hydrology Proposed Action Alt 1 | Total area | 7680 | L | L | 1-2 | None | Due to some alteration of natural surface drainage No impacts anticipated | | | | |
| Soils Proposed Action Alt 1 | Total area | 7680 | L | L | 16, 19, 20 21, & 22 | None | Due to low amounts of displacement, compaction and accelerated erosion No impacts anticipated | | | | |
| Climatology Proposed Action Alt 1 | Total area | 7680 | No | No | None | None | No impacts anticipated No impacts anticipated | | | | |
| Air Quality Proposed Action Alt 1 | Total area | 7680 | M | M | None | None | Due to emission of non-condensable gases No impacts anticipated | | | | |
| Vegetation Proposed Action | A | 460 | H (H)L | 6 | Low rating applies except in case of blow-out or spillage of contaminated geothermal fluid | | | | | | |
| | B | 2830 | M M | 12, 21, 22 | Only minor impacts were mitigated, surface disturbance will still occur | | | | | | |
| | C | 230 | H (H)L | 6 | Low rating applies except in case of blow-out or spillage of contaminated geothermal fluid | | | | | | |
| | D | 1890 | L L | 12, 21, 22 | Only minor impacts were mitigated } Surface disturbance | | | | | | |
| | E | 500 | M M | | Only minor impacts were mitigated } | | | | | | |
| | F | 1420 | L L | | Only minor impacts were mitigated } | | | | | | |
| | G | 350 | L L | | Only minor impacts were mitigated } | | | | | | |
| Alternative 1 | Total Area | 7680 | No | No | None | No impacts anticipated | | | | | |
| Wildlife Proposed Action | A | 350 | H H/M | 3-6 | High after mitigation, only in case of blow out or spillage of contaminated geothermal fluid | | | | | | |
| | B | 460 | H H/M | 6 | High after mitigation, only in case of blow out or spillage of contaminated geothermal fluid | | | | | | |
| | C | 2830 | M M | 3, 7-10 | Only minor impacts mitigated | | | | | | |
| | D | 230 | H L | 12, 21, 22 | After mitigation, the entire area is within 1/2 mile buffer zone around lake, no surface occupancy will be allowed | | | | | | |
| | E | 2390 | L L | 3-6 | Only minor impacts mitigated } Surface disturbance | | | | | | |
| | F | 1420 | L L | 3-6 | Only minor impacts mitigated } will still occur | | | | | | |
| Alternative 1 | Total Area | 7680 | No | No | None | No impacts anticipated | | | | | |
| Domestic Animals Proposed Action | A | 640 | M M | None | Grazing impacts: Due to absence of important annual forage that would be destroyed | | | | | | |
| Alternative 1 | Total area | 7680 | L L | None | Due to loss of such a small percentage of range area No anticipated impacts | | | | | | |
| Cultural Resources Proposed Action | A | 2700 | H L | 6, 13 | Activity is not allowed here. Still may be minor indirect impacts | | | | | | |
| | B | 960 | H H | 13-14 | Mitigation still destroys sites, but should be few sites Any sites will be gone, but there may be no sites | | | | | | |
| | C | 820 | M M | | Any sites will be gone, but there may be no sites | | | | | | |
| | D | 3200 | M M | | No anticipated impacts | | | | | | |
| Alternative 1 | Total area | 7680 | No | No | None | No anticipated impacts | | | | | |
| Visual Resources Proposed Action | A | 5170 | M L | 11 | High visibility, flat insignificant vegetation | | | | | | |
| | B | 2610 | L L | 11 | Distance from freeway, increased topographic variation and vegetation | | | | | | |
| Alternative 1 | Total area | 7680 | No | No | None | No anticipated impacts | | | | | |
| Recreation Proposed Action Alternative 1 | A | 865 | M L | None | Small game habitat. Low numbers of recreationists | | | | | | |
| | B | 6816 | L L | None | Small game habitat. Low numbers of recreationists | | | | | | |
| | Total area | 7680 | No | No | None | No anticipated action | | | | | |
| Wilderness Proposed Action Alternative 1 | Total area | 2700 | L L | None | Due to possibility of diminished wilderness qualities No anticipated impacts | | | | | | |
| Land Use Proposed Action Alternative | Total area | 7680 | No | No | None | No anticipated impacts No anticipated impacts | | | | | |
| Socio-Economics Proposed Action Alternative 1 | Total area | 7680 | No | No | None | No anticipated impacts No anticipated impacts | | | | | |

FORD DRY LAKE GEOTHERMAL E.A.

Impacts after Mitigation

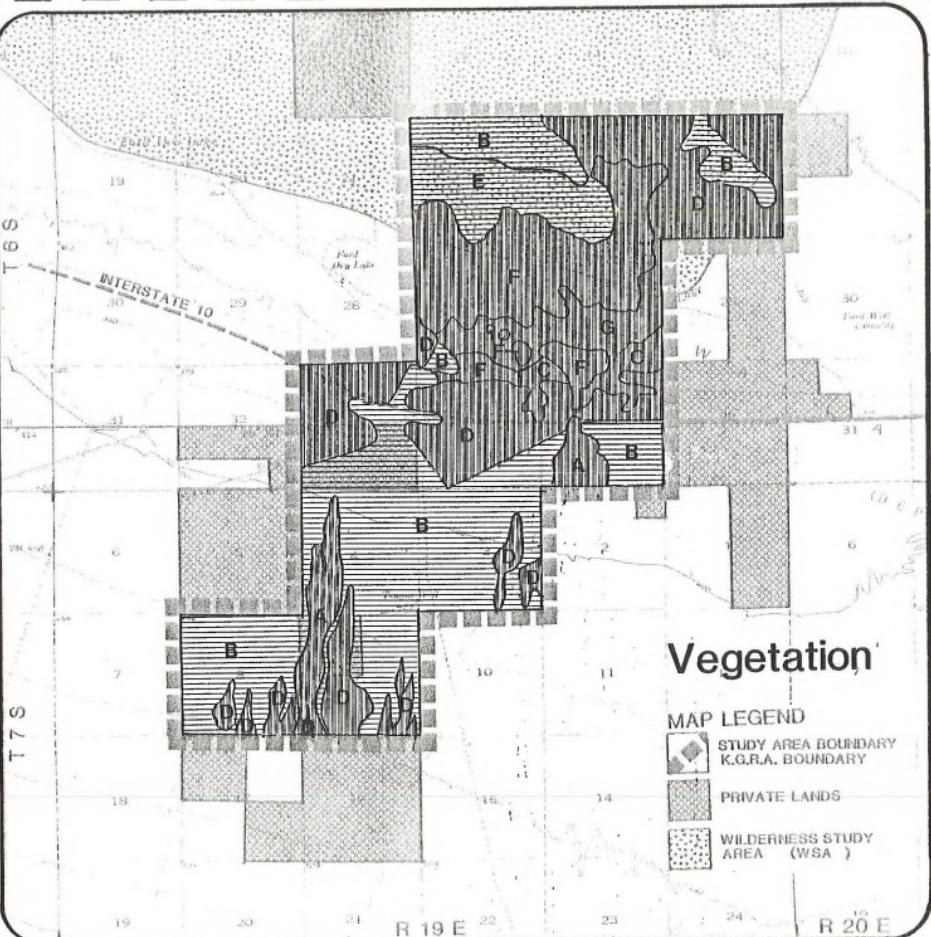


*ZONES A AND C ARE HIGH IMPACT AREAS IN CASE OF ACCIDENTS

Vegetation

MAP LEGEND

- STUDY AREA BOUNDARY
- K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



Map 15



FORD DRY LAKE GEOTHERMAL E.A.

Impacts after Mitigation



High



Medium



Low*



No

* ZONES A AND B ARE HIGH IMPACT AREAS IN CASE OF AN ACCIDENT

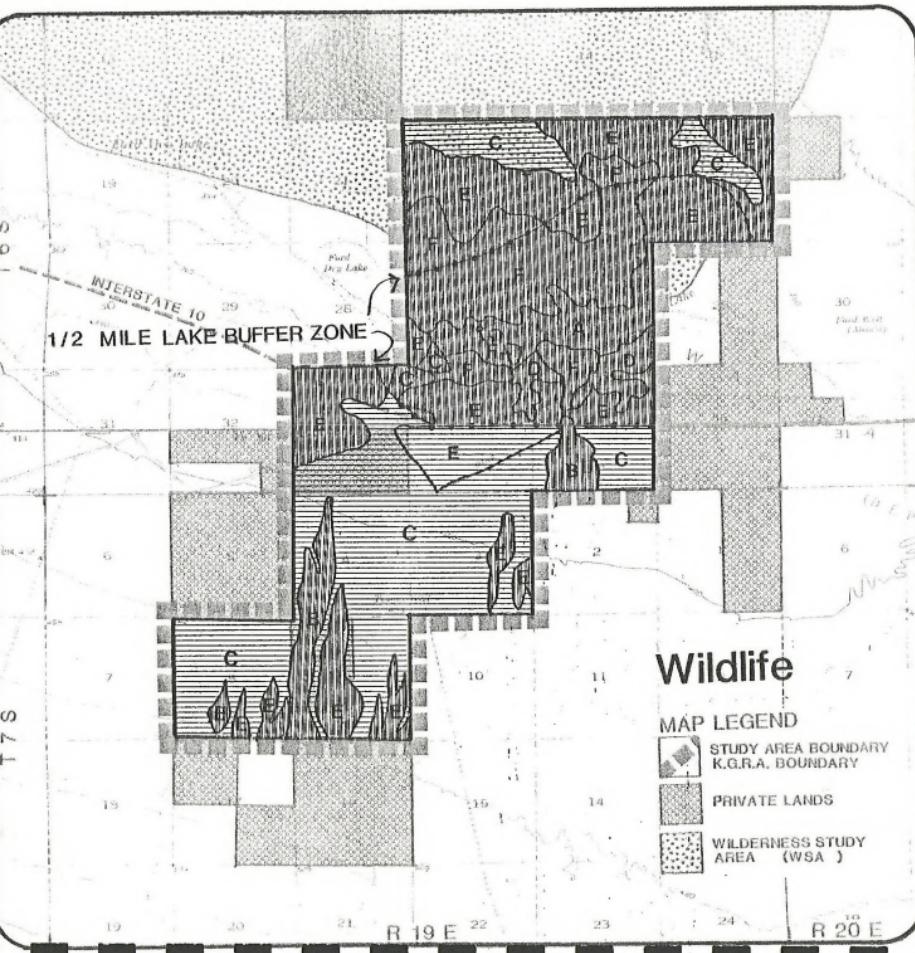


Map 16

Wildlife

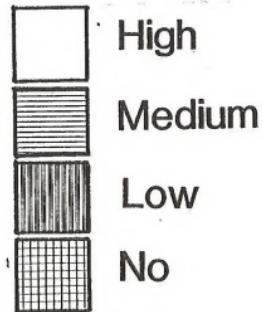
MAP LEGEND

- STUDY AREA BOUNDARY / K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



FORD DRY LAKE GEOTHERMAL E.A.

Impacts after Mitigation



Map 17

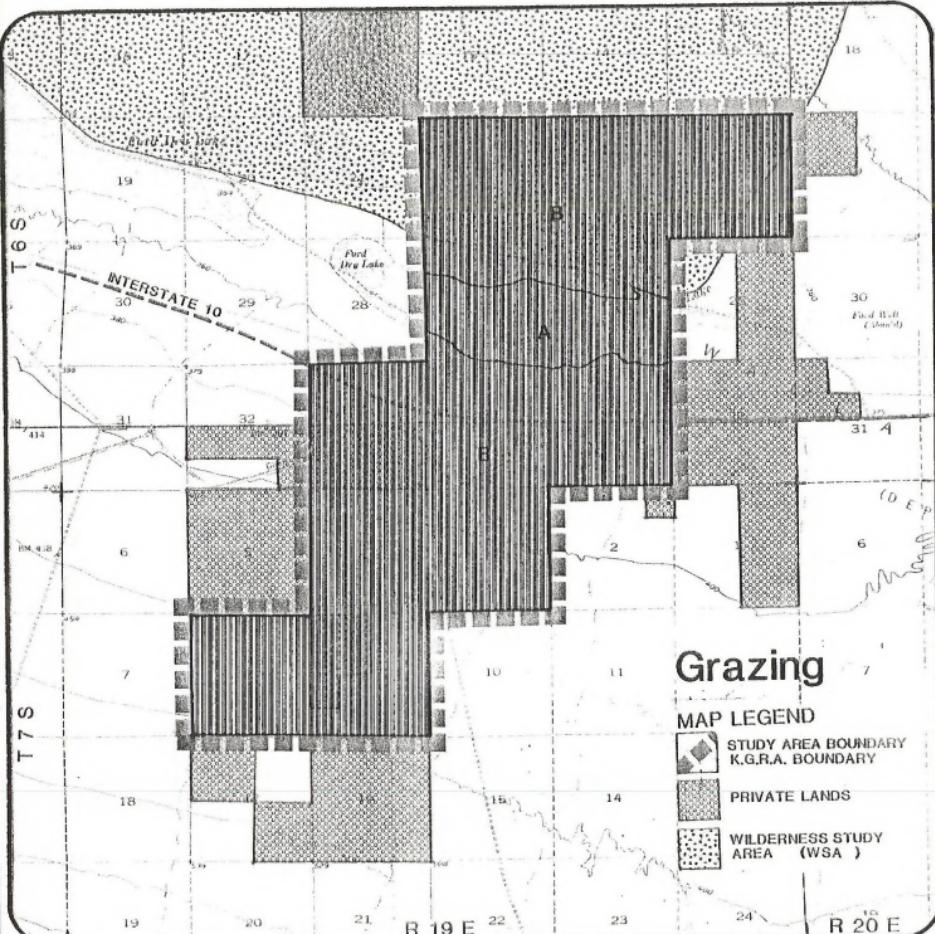


0 MILES 1 2

Grazing

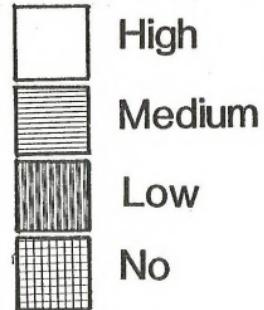
MAP LEGEND

- STUDY AREA BOUNDARY
- K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



FORD DRY LAKE GEOTHERMAL E.A.

Impacts after Mitigation



Map 18

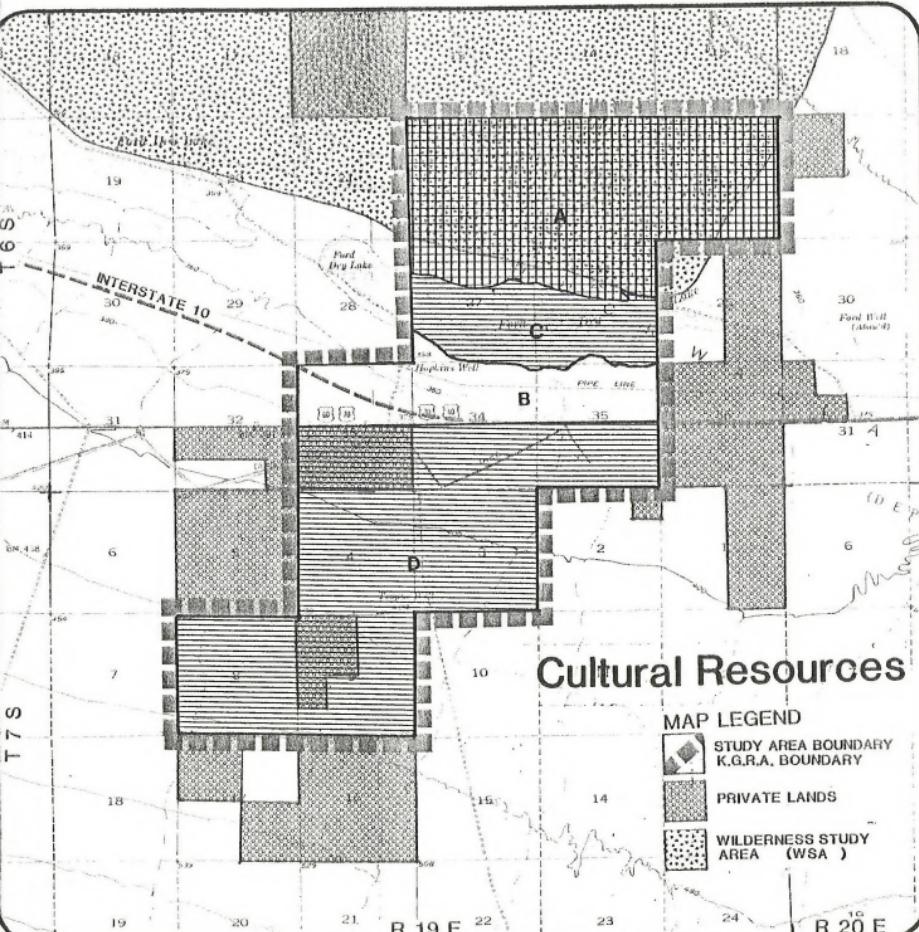


0 MILES
1
2

Cultural Resources

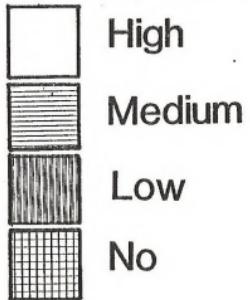
MAP LEGEND

- STUDY AREA BOUNDARY
- K.G.R.A. BOUNDARY
- PRIVATE LANDS
- WILDERNESS STUDY AREA (WSA)



FORD DRY LAKE GEOTHERMAL E.A.

Impacts after Mitigation



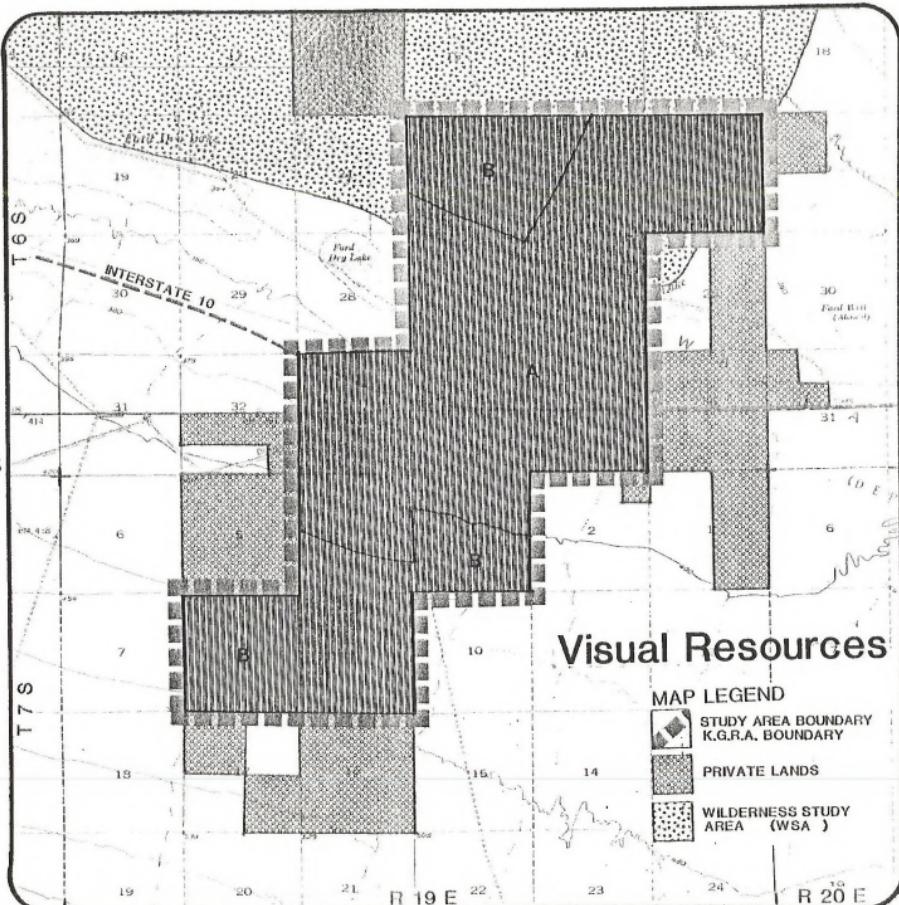
Map 19



0 MILES 1 2

Visual Resources

- MAP LEGEND
- STUDY AREA BOUNDARY
 - K.G.R.A. BOUNDARY
 - PRIVATE LANDS
 - WILDERNESS STUDY AREA (WSA)



FORD DRY LAKE GEOTHERMAL E.A.

Impacts after Mitigation



High



Medium



Low

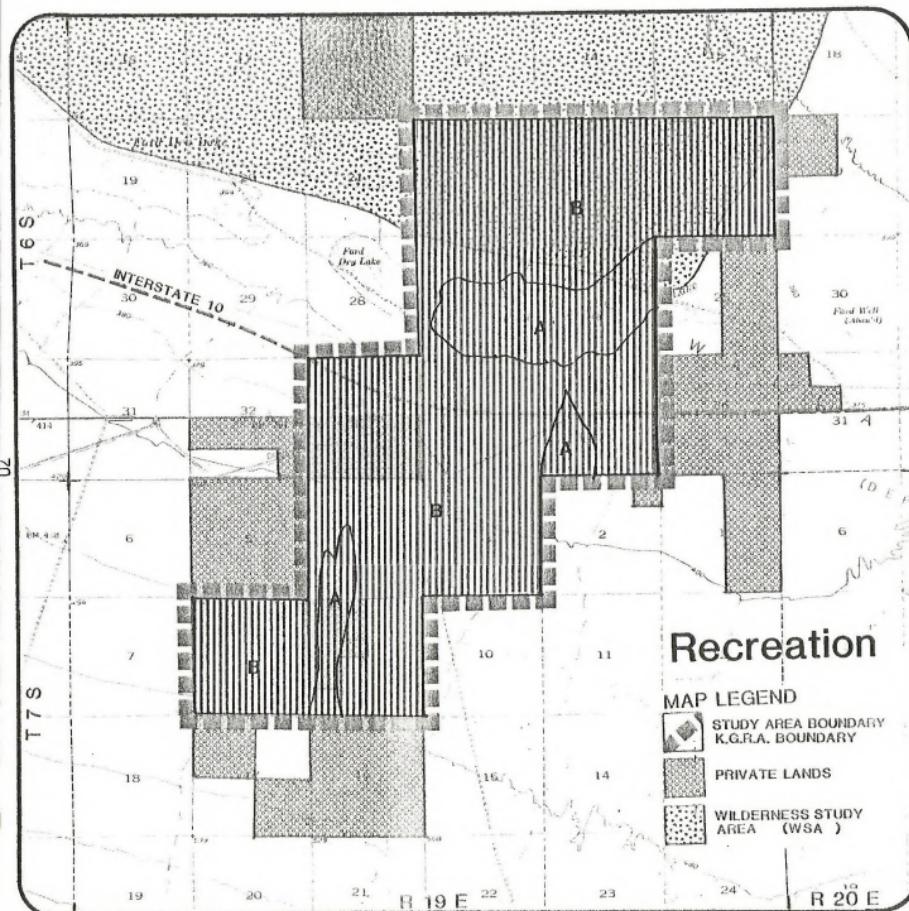
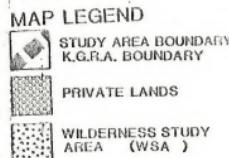


No

Map 20



Recreation



VII. UNAVOIDABLE ADVERSE IMPACTS

A. Introduction

This chapter describes the adverse impacts which could be expected to remain after the applicable mitigation measures in the preceding chapter have been applied. These impacts are therefore considered unavoidable.

B. Geology

It is remotely possible that increased subsidence and/or seismicity may result from the withdrawal and reinjection of geothermal fluids.

C. Hydrology

If the unlikely event of a well blow-out or rupture were to occur, the impacts to subsurface and surface water systems would be unavoidable, and could be very damaging to the local area.

D. Soils

Some soil compaction will result from the proposed action and/or its alternatives.

Soil compaction could reduce growth of annuals or reestablishment of perennials in the compacted areas.

Soils could become contaminated due to accidental spillage of chemicals, improper disposal of waste, etc.

Some accelerated erosion of disturbed soils will occur.

E. Air Quality

Non-condensable gases may be released into the environment, resulting in a reduction in air quality. The odor of H₂S may be present.

F. Vegetation

- 1) Habitat could be permanently lost in areas of intense soil disruption or compaction where rehabilitation is unsuccessful.
- 2) Wind-born and/or water-born contaminants could result in declines in plant vigor or damage or death of vegetation. These impacts could result either through direct contact of vegetation with contaminants or modification of nutrient cycles by contaminants in the soil.

- 3) Wind and possibly water erosion will occur on all disturbed soils.

G. Wildlife and Domestic Animals - Grazing

Wind and water born pollutants could result in a loss of wildlife or a decrease in vigor. Pollutants could also inhibit vegetation growth affecting those associated animals.

Habitat could be permanently lost in areas of intense soil compaction where rehabilitation is unsuccessful.

Noise will affect those animals inhabiting areas near the plant and well heads.

Noise may drive animals away and cause physiological stress or damage and interfere with auditory clues and interspecific communication.

Some wildlife and domestic animals will be lost due to collision resulting from the increased use of roads. Additional losses may also occur due to collision with powerlines.

Wildlife will be subject to increased human intrusion due to improved access. Hunting levels may also increase, especially at the lake.

A small percentage of area for grazing would be lost.

H. Cultural Resources

Unavoidable adverse impacts result primarily from the fact that even when full mitigation measures are taken, including full-scale mapping, photography, collection and excavation, some data is lost and the site context is lost.

Even with total avoidance, the problem of indirect impacts resulting from increased numbers of people in the area remains.

Impacts after mitigation remain high (assuming a high level of action) in Zone B, which is a medium sensitivity area of approximately 960 acres. These impacts stem primarily from the fact that although there is not a great amount of cultural material, cultural resources, once gone, can never regenerate themselves as vegetation or wildlife can. The fact results in a high impact rating for areas with known cultural resources. This loss, however, can be mitigated with proper data retrieval. Some areas have a very low potential for containing cultural resources, and have been assigned a lesser impact value.

I. Visual Resources

Changes to the natural character of the landscape that will occur will alter the form, line, color, and texture beyond the acceptable limits of the management class. (VRM Class III).

J. Recreation

There will be some loss of hunting opportunities.

K. Socio-economic

The impacts on the social and economic environs of the community are considered to be beneficial, thus no adverse impacts are foreseen.

VIII. PERSONS, GROUPS, AND GOVERNMENT AGENCIES CONSULTED

- Colorado River Indian Tribes
- Archaeological Research Unit, University of California Riverside
- State Historic Preservation Office
- Native American Heritage Commission
- Chemehuevi Tribal Offices
- Cabazon Tribal Council
- Torres-Martinez Indian Reservation
- The Resources Agency of California
- Air Resources Board
- Bureau of Indian Affairs
- Cal Trans (State of California Department of Transportation)
- California Department of Fish and Game
- California Native Plant Society
- Desert Protective Council
- Federal Aviation Administration
- National Audubon Society
 - Coachella Valley Chapter
 - Long Beach/Eldorado Chapter
 - San Bernardino Chapter
- California Office of Planning & Research
- Riverside County Board of Supervisors
- Sierra Club
 - San Gorgonio Chapter
- Southern California Air Pollution Control Board
- Soil Conservation Service
- South Coast Air Quality Board

- California State Clearing House
- California State Water Resources Board
- U. S. Fish and Wildlife Service
- U.S. Geological Survey
- Water and Power Resources Service

IX. INTENSITY OF PUBLIC INTEREST

A public workshop was held in Blythe on March 14, 1981, to solicit public opinion on what the major concerns were in relation to leasing public lands for geothermal development in the Ford Dry Lake Study Area. Parties who were thought to have an interest in the area were invited. They included, adjacent landowners, state and local government resource representatives, and private citizens.

The meeting was conducted between 10 a.m. and 2 p.m. and drew 20 participants. Their primary concerns were the effects of the plant on private lands including agricultural development, domestic animal development, and rights of way. These concerns were addressed in the EA.

The 45 day public review period ran between July 4, 1981 and August 17, 1981. During this period, a small number of letters from the public were received on this project. Most were concerned with the effects this project would have on adjacent private land holdings. All inquiries were responded to by mail. There were also several comments from State of California agencies. These concerns have adequately been taken care of in the Final EA, by adding or clarifying the appropriate items.

Another public meeting was held on Saturday, August 1, 1981, to answer any question the public might have on the Draft EA. Six people were in attendance and all were in agreement with the analysis set forth by the Draft EA.

In summary, public interest in this project was low, due to the nature of the proposed impacts and the benefits of development of the geothermal resource.

X. PARTICIPATING STAFF

| Name | Position | Section Responsibility |
|---------------------|---|--|
| Pamela M. Elliott | Landscape Architect Outdoor Recreation Planner | Team Leader Noise Air Quality Climatology Graphics |
| John A. Adams | Soil Scientist | Soils |
| J. Anthony Danna | Range Conservationist | Grazing |
| Faye J. Davis | Wildlife Biologist | Wildlife |
| Frank L. Disparte | Planner | Socio-economics |
| Roberta L. Grannis | Clerk Typist | Typing |
| Mark R. Hatchel | Realty Specialist | Land Use |
| Robin L. Kobaly | Botanist | Vegetation |
| Robert F. O'Brien | Landscape Architect Outdoor Recreation Planner | Visual Resources/ Recreation |
| Judyth E. Reed | Archaeologist | Cultural Resources |
| Matthew W. Shumaker | Geologist | Geology |
| Duane A. Winters | Hydrologist | Hydrology |

XI. MANAGEMENT APPROVALS

The environmental impacts of the proposed action have been assessed. I conclude that the proposed action is not a major federal action which would significantly affect the quality of the human environment. Preparation of an environmental impact statement pursuant to Section 102 (2) (c) of the National Environmental Policy Act of 1969, is not required.

Recommended By:



Pamela M. Elliott
Team Leader

September 9, 1981

Date

I Concur:



Brian B. Booher
Area Manager

9-11-81

Date

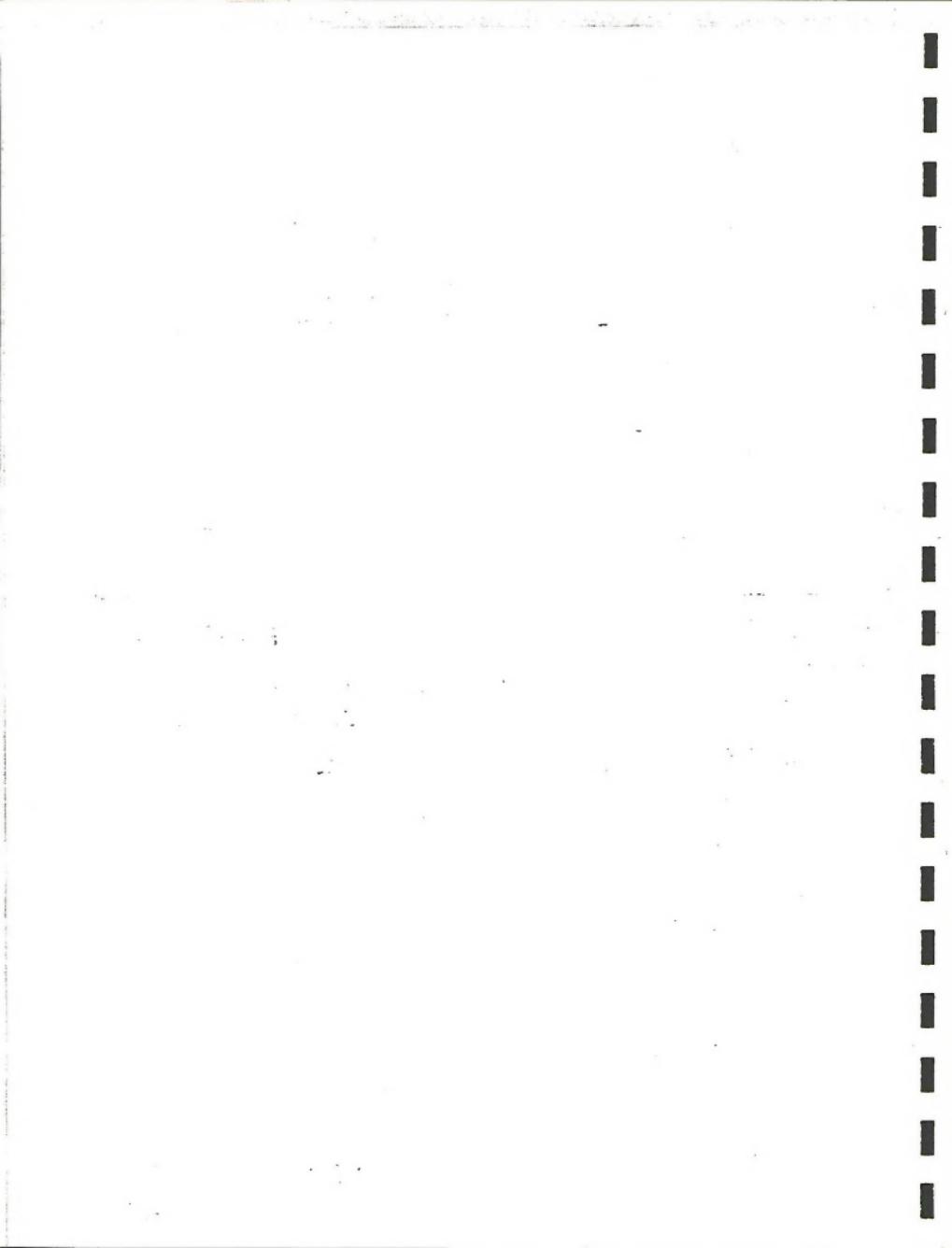
I Concur:



Gerald E. Hillier
ACTING District Manager

9/23/81

Date





United States Department of the Interior

IN REPLY REFER TO
3200
(C-066.22)

BUREAU OF LAND MANAGEMENT
Indio Resource Area
3623 H101 Canyon Crest Drive
Riverside, California 92507

Interested Parties:

Subject: Final Environmental Assessment (EA) for Proposed Competitive Geothermal Leasing in the Ford Dry Lake Area of Eastern Riverside County, California.

Enclosed is a copy of the Final Environmental Assessment (EA) for proposed competitive geothermal leasing in the Ford Dry Lake Area. This EA analyzes the impacts which would result if the geothermal resources were developed in the study area.

The impacts of subsequent plans of operation prepared by the lessee, will be addressed in site specific Environmental Analyses which will be prepared by the United States Geological Survey (USGS).

If you have any questions concerning this document, please call Pam Elliott, Team Leader, at (714) 787-1382.

Sincerely,

A handwritten signature in black ink that appears to read "Brian B. Booher".

Brian B. Booher
Area Manager

Enclosure

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DENVER, CO 80225

GB 1199.7 .F67 L362 1981
U. S. Bureau of Land
Management. Indio Resource
Final Ford Dry Lake known
geothermal resource area

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DENVER, CO 80225

FINAL
Environmental Assessment # CA-066-1-2
for
Proposed Geothermal Leasing
in the
Ford Dry Lake Known Geothermal Resource Area
Riverside County, California

Prepared by
the
United States Department of the Interior
Bureau of Land Management
California Desert District
Indio Resource Area Office

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DENVER, CO 80225



Prepared by:
Pamela M. Elliott, Team Leader

September 9, 1981

Date



Reviewed by:
John A. Hall, Chief of Resources
Indio Resource Area

September 10, 1981

Date



Recommended by:
Brian B. Booher, Area Manager
Indio Resource Area

7-11-81

Date



Approved by:
Gerald E. Hillier, District Manager
California Desert District

9/23/81

Date

